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The Steel Combine.

The great steel combination still attracts a large share of public attention and there is much speculation as to probable results of it. One of the most notable among these results so far is the introduction by a prominent Republican Congressman of a bill designed to put all products of the combine on the free list. This action will of course be viewed in different ways, depending upon one's attitude toward industrial combines or one's political beliefs, but it is scarcely necessary to say that Chairman Babcock does not advocate his measure as an enemy of the protective system, but simply because, as he says in effect, it seems a little absurd for us to protect from foreign competition an organization which, so far from being an "infant industry" is perhaps the greatest industrial giant the world has thus far seen and can demonstrably make things very interesting for competitors in any market of the world wherein it has a fair chance. In other words, it has been shown that European steel producers can be beaten by this combination in open or neutral markets whenever it chooses to do so.

This fact gives to our American machinery builders a peculiar interest in the matter. Some time ago it was announced that the policy of one of the combines that now form a part of the giant combine would be to first market as much of its product as possible here at home at the market price and then sell its surplus product abroad at prices that would give a controlling influence in foreign markets; in other words, American steel was to be sold abroad at considerably lower prices than here. It is fair to presume that this will be the policy of the great combination, and if so it is easy to see that its direct effect will be to cripple American machinery building interests. A large proportion of American-made machinery is for sale abroad, and no maker of such machinery needs to be told that a policy under which a foreign builder of similar machines can buy American steel at a lower price than the American builders can buy it will be decidedly injurious to the important foreign business of American machinery builders. To ask these American machinery builders to sustain such a policy or to advocate the retention of import duties designed to protect such a combination from the competition of foreign steel makers is to ask American machinery builders to kindly assist in adjusting to their own necks the rope with which they are to be strangled, and if we know American machinery builders very few of them will do any such thing. The vast majority of American machine-tool builders have been believers in and supporters of the protective tariff principle, and probably still are, but they are not so bigoted as to be blind to their own interests, and certainly cannot be depended upon to support a policy which is plainly prejudicial to their own welfare.

It is extremely doubtful if the men who have organized this giant combine have expected to indefinitely retain the benefits of protection on their products. They almost certainly have considered the possibility of such protection being removed as a result of their action, and we believe have discounted it and are fully prepared to meet it. This view of the case is sustained by the circumstance that steel stocks quotations were not affected by the introduction of Mr. Babcock's bill nor by the discussion that has been caused by it.

American Machinery Trade in Russia Crippled.

Some time ago we mentioned the fact that action was contemplated by the United States Government which would favor the sugar trust at the expense of American machinery trade in Russia. Such action has been taken by the levying of an extra duty upon Russian beet sugar upon the ground that the exemption of the Russian producers of such sugar from the payment of certain government taxes amounted to a bounty upon exports, which our reciprocity trade arrangements with Russia were designed to prevent. The Russian Minister of Finance has promptly retaliated by the abrogation of the provisions of the Russian tariff law under which our steel and iron and manufactures thereof were admitted at special rates, and the net result is that while American citizens are more completely prevented from consuming sugar without paying tribute to the sugar trust, those of them who are interested in the foreign trade in machinery are practically shut out of Russia; the advantages which English, German and other European machinery builders will now have making it likely that Americans can do very little there. The Russian duty was already higher than any other in Europe and will after March 1 be practically prohibitive, so far as American machinery is concerned—more so, of course, than it would be if the increased rates applied to English and German machinery as well. Our imports of sugar from Russia have amounted to an average annual value of about $72,000, while our exports of steel and iron and manufactures thereof have amounted in one year to over $7,000,000. No one who has seen Russia and who really thinks for himself can for a moment doubt that Russia will be far more injured by this exclusion of American machine tools, sewing machines and agricultural machinery than American producers of these things will be, but that fact will not be likely to affect the result; at least, not for some time, and for the present about the only hope of relief seems to be in the fact that our courts may nullify the action of the Treasury Department and thus remove the cause of Russia's retaliatory action.

The Automobile Club of America opened its new quarters at 753 Fifth avenue, New York, on the 16th inst., with a reception and banquet. Its location is at the corner of Fifty-eighth street and from its windows there is a view of the Plaza and a portion of Central Park overlooking an ideal place for the commencement of auto trials or club runs. The club now has a membership of 300. Albert T. Shattuck is president and Malcolm W. Ford, secretary.

Notes on Foreign Markets.

THE EUROPEAN SLUMP.

The depression in the iron and associated industries is being given serious consideration throughout Europe and the American relation to it comes in for attention. Germany's complaint we have frequently set forth. In Russia the Minister of Agriculture has called a meeting of iron manufacturers to consider the crisis which, it is said, has brought the majority of puddling furnaces and rolling mills to a standstill. The government proposes to take energetic measures of relief. From Hungary, Consul Hughes reports that nearly all branches of industry have been depressed, although the crops are good. Many miners have emigrated. An agent of a large agricultural house tells him, however, that American machines still sell well. From Edinburgh, Consul Fleming reports alarmingly. "To describe the difference in the condition in the metal trades at the beginning and at the end of last year," says he, "would be to contrast enormous activity and practical stagnation." This depression is attributed in part to a fall in prices on metals, but chiefly to offers of American iron and steel at reduced prices which came upon the market last autumn with crushing effect. What made the difficulty worse for British producers was that Germany, having bought largely from America in the spring and summer, became alarmed and resold in England at reduced figures, also placing iron and steel on the market in competition with American manufactures.

The press in general, says Mr. Fleming, blames the manufacturers for not adopting labor-saving machinery in all branches of production where it can be introduced, and blames the workmen for their undisguised hostility to all labor-saving devices. He says: "It is the accepted opinion that in the matter of technical education Great Britain is far behind the United States and Germany."

THE SITUATION IN GERMANY.

Consul Barnes reports from Cologne, January 10, 1901, that the iron market continues stagnant. Foreign competition has very little chance, except under the most favorable circumstances. In the machinery market prices are lower all around and shipments which last year were quoted f. o. b. factory are now quoted f. o. b. Australian and American ports. Locomotive and mining-machinery shops are busy, and considerable trade in American mining machinery is done through English agents. In regard to the latter line, the consul advises manufacturers to appoint continental agents, and, in some cases, to grant licenses to manufacture to firms of good standing. This, he thinks, would not only save freight and duty, but would result in a largely increased business, as continental mine owners have great confidence in their own manufacturers. He urges upon American manufacturers the necessity of thoroughly protecting their inventions by patents before exhibiting them in the principal European countries.

ELECTRICITY IN INDIA.

Electricity is finding a broadening application in India, and especially in Calcutta, which has taken the lead in this respect among Asiatic cities. Its popularity there has in a short space of time assumed vast proportions. All public and private buildings of any pretension are said to have their electric installations for lighting and punkahs. There has been a proposition on foot to introduce electric lighting and railway systems in Rangoon, Burmah. A very important project under the government of Mysore, India, is to develop the Cauvery Falls to furnish power for gold-mining purposes, etc. About 40,000 horse-power would be utilized and the cost is roughly estimated at $1,000,000. In an official document relating to the matter, it is mentioned that "the cost of works, the plans of which have to be supplied by the contractors in America," etc.—from which it is to be inferred that American electricians are promoting or are closely in touch with the scheme of development. There is more or less antagonism to the project, and although some maintain that the government is enthusiastically in favor of it, the opposition points out that Lord Curzon appears unsympathetic. The achievements of American competition are attracting as much attention in India as in nearer parts of the British Empire. The columns of our contemporary, "Indian Engineering," make this evident. "The Americans are still scoring," remarks that journal in one place, "as they have got a big order from the Assam-Bengal Railway."

ANOTHER INDIAN JOURNAL'S TRIBUTE TO AMERICAN SUCCESSES.

Although Germany is a keen competitor of Great Britain, especially in Eastern markets, this, according to the "Indian and Eastern Engineer," is more particularly true of dry goods, while "in engineering and hardware material they are not to any extent in the running. The nation, however, which is undoubtedly making big inroads into what were till recently British preserves is America. American engines receive at least equal favor with British in Japan. In North China the hardly used line of the Imperial Chinese Railways was worked by American engines, while in India they have been installed on many lines, north, south, east and west; availing themselves of the enormous facilities of the American rolling mills, the East Indian Railway have been purchasing consignments of rails for their permanent way. The link in the Burmo-Chinese Railway, the Gokteik gorge viaduct, is approaching completion at the hands of the Pennsylvania Steel Company. American hydraulic dredgers have been supplied for the Hooghly and Australian ports; and it is said that desperate efforts are being made to place the order for the coal transportation plant required at Calcutta with an American engineering firm. These are some of the more striking recent successes of American engineering enterprise. In the general field of hardware supplies their advance, if less dramatic, is as marked. The keynote of the American system is adaptability, and adaptability is half the battle."

MINING MACHINERY IN CANADIAN GOLD FIELDS.

There is believed to be an excellent field for mining machinery and tools now opening in the Central Canadian Gold Fields. What is especially needed is machinery for the adequate equipment of proved mines with improved machinery and gold-saving appliances. The development of water powers holds out great opportunities in that section of Canada which is said to contain 70 important ones, in which some 7,000,000 horse-power are running to waste, the bulk of which could readily be utilized. At the falls of Keelvatin, which are now bridled with a stone dam, 70,000 to 100,000 is flowing idly. British mining machinery manufacturers are urged to cultivate the Canadian gold region. Those in America, and the electrical engineers as well, will be slow if they do not take the hint.

AN AMERICAN EXCHANGE IN GUADELOUPE.

"The American Exchange," Point a Pitre, Guadeloupe, West Indies, has been established to promote the importation of American products. The goods to be handled will include steam engines and fittings of all kinds, steam and small pumps, machinery of various kinds, tools, corrugated iron, light portable railroads, etc. An additional opening may be found for electrical machinery. There are a number of improvements already under consideration in Guadeloupe for the electric lighting of towns and cities, the establishment of steam and electric railroads, bridges, etc. The Exchange will pay all freight expenses, duties, etc.; it will also receive on consignment sample orders of articles in well-established lines from parties desiring to enter into competition for the business. Prices are desired with catalogs sent. For a number of years past our American consul at Guadeloupe has been endeavoring to get some one to seriously take up such a project, but financial conditions stood in the way. Recently there has been a marked improvement in these conditions.

J. H. Williams & Co., the drop forgers of Brooklyn, have voluntarily arranged with their employees that their factory shall be put upon the basis of a nine-hour working day commencing March 1. There is to be no change in the pay of operatives, which will remain the same for nine hours' work that it now is for ten hours. Notice to this effect has been posted on the bulletin boards.

Commercial Review.

NEW YORK, Saturday, Feb. 16.

ELECTRICAL AND OTHER MACHINERY.

The dynamo and motor market is in quite satisfactory shape, so far as demand goes. Reports of marked improvement in the last few weeks are heard from different quarters, and the amount of inquiry augurs well for the year's trade. There is a good deal of activity in the small motor trade hereabouts. The ordinary run of trade in isolated lighting and power plants is satisfactory. There is, however, a manifest disposition to cut prices in order to secure contracts on the smaller sizes of machines.

The Crocker-Wheeler Company put on a night force about ten days ago.

A rumor has been afloat of a closer alliance between the General Electric and Westinghouse Electric and Manufacturing companies, which will involve an exchange of patents and an arangement to prosecute jointly any infringements of their patents of the polyphase system. The relations of these two concerns are already understood to be close—in contrast to their hostility some years back—and nothing in the nature of a more formal union between them need cause surprise. Weight was added to this late rumor by the fact that the General Electric stock jumped from 198¾ to 215 in one day, a result, it is said, of inside buying.

The Eddy Electric Company is supplying very many motors to automobile builders, the orders being widely distributed.

The Bullock Electric Manufacturing Company has opened an office at Buffalo, New York, 675 Ellicott square, under the management of Francis B. Smith, an electrical engineer of wide practical experience. The Bullock Company's trade in January showed a fine run of orders, including some large ones for export. The company will furnish to the McCloud River Electric Power Company, McCloud, Cal., four 500 kilowatt alternators, a 22½-kilowatt exciter and fifteen 175-kilowatt transformers for a long-distance transmission system.

T. Suzuki, superintendent of the collieries of the Imperial steel works at Yawatamura, Japan, and S. Ichikwa, chief electrician of the Hokkaido Coal Mining and Railroad Company, with headquarters in Tokio, were visiting the Westinghouse works at East Pittsburgh lately and inspecting some of the larger machine mines in the Pittsburgh district. Mr. Ichikwa decided to place with the Westinghouse company orders for electric equipment that will aggregate almost $200,000.

The many new buildings of the Stanley Electric Manufacturing Company, Pittsfield, Mass., have all been enclosed and are expected to be running May 1. The new machinery for the plant will cost about $60,000 and over $40,000 worth has already arrived. The company was recently said to have orders on hand aggregating over $500,000, and it has been necessary the past year to run the Renne avenue factories twenty-three hours daily. Three contracts, amounting to $1,500,000, were being figured on by the Stanley company, and the smallest, $250,000, had been secured.

Bids are invited by the Lewiston (Pa.) Knitting Company, owned by Thompson Bros., Milroy, Pa., upon a lighting generator, steam and heating plant, for a new 130x50 foot two-story mill.

The most notable gain among foreign shipments of American machinery for the year 1900 is in electrical machinery exports, which were $5,286,224, as compared with $3,145,838 for 1899, an increase of 68 per cent. Stationary engines show a still larger per cent. gain, but the exports in this line are by no means so heavy as in the electrical.

A movement for a consolidation of leading interests in the file industry is on foot. The directors of the Nicholson File Company, Providence, R. I., by permission of the legislature, voted, February 14, to increase the capital stock from $1,000,000 to $2,000,000. This company which in time past has absorbed several other file works is now negotiating to acquire two new file and rasp works, the names not yet being stated from an authentic source, because the deal has not yet fully been carried out. Not unlikely, however, the rumored purchase of the Arcade File Works, Anderson, Ind., to which we have alluded before, is part of the transaction.

Hill, Clarke & Co., Boston, Mass., have opened an office in New York City, at 253 Broadway, Room 205, and E. D'Amour, of the firm of D'Amour & Littledale, will have charge of their New York business. They have several new machines that they are putting on the market which they wish to introduce quickly, and have opened the New York office on this account.

Following the acquisition of the Pratt & Whitney Company by the Niles-Bement-Pond Company, Mr. Cregar gives up the management of the New York P. & W. office and will return to Philadelphia and devote his entire energies to the management of the J. W. Cregar sales agency of the Bourse. He has secured the exclusive sale of the Pratt & Whitney Company's line of machine tools in Eastern Pennsylvania from Altoona east, in New Jersey from Trenton south, and in Delaware, Maryland and Virginia. In addition he will handle the lines now carried by the Cregar agency, including a line of the Hendey Machine Company's tools. He retains his agency for the American Turret Lathe Company in the eastern part of the country and will continue the New York office which he has opened for the sale of this company's machines. Other lines to be carried by Mr. Cregar may be announced later and he is prepared to accept further agencies. The interests of which Mr. Cregar has had charge during his two years spent in New York appear to have flourished under his management.

W. S. Accles, manager of the English branch of the Niles Tool Works Company, has been for a visit at the home office. While here he has expressed his views upon the English tool market to a representative of this paper.

The English market for heavy tools, as Mr. Accles finds it, is still fair and the prospects comparatively good. The effects of a growing competition against American tools are, however, distinctly apparent, and it looks as if this adverse influence would be still more strongly felt as time goes by. The English works have emerged from the handicapped condition in which they were at the end of the engineers' strike, and can fill orders promptly. New tool-building works have been built and are continuing to go up. Besides the sharper native competition, there is a strong invasion of German tools. Many of the houses representing American firms are handling German tools as well. Many of them also are having copies of American tools built in England for their trade.

But while difficulties are being met with in the English heavy tool market, Mr. Accles does not regard the light tool trade as being similarly affected. In many of these lines Americans enjoy a monopoly of design. In this department they have also an advantage in price, while for heavy tools of high grade the price footing of English and American builders is about equal

Mr. Accles notices that a good deal of conservatism is still manifest among English manufacturers in regard to adopting American designs; and while some are doing so, they are quite apt to add improvements of their own.

One of the factors to be reckoned with in the English tool market at present is the extensive dismantling of bicycle works.

The Toledo (Ohio) Machine and Tool Company has for several months past been crowded with orders for shovel plants. Four of these plants, ranging in capacity from seventy-five dozen to two hundred and fifty dozen per day, will be shipped within the next four weeks.

The first annual meeting of the stockholders of the Oneida (N. Y.) Steel Pulley Company was held February 6. The seven directors elected were John Maxwell, Edward T. Shepard, Theodore F. Hand, Nelson G. Stark, Roswell B. Downing, Rhody Toher and C. W. Chappell. Subsequently the directors organized by re-electing Mr. Maxwell president; Mr. Stark, vice-president; Mr. Downing, treasurer, and Mr. Shepard, secretary and manager. The stockholders decided to increase the capital stock from $75,000 to $125,000. The company was organized a few months ago and has acquired an established business through the purchase of the interests of the Fulton Pulley Company.

At the recent annual meeting of the Philadelphia Pneumatic Tool Company, Philadelphia, the board of directors was increased from three to six members, the new ones being Thomas Scattergood, Julius Keller and A. L. Phillips. The latter two were brought into the company through the purchase by the Philadelphia Pneumatic Tool Company of the capital stock and the plant of the Keller Tool Company, who have heretofore been manufacturing pneumatic tools exclusively for the Philadelphia Pneumatic Tool Company. This consolidation of the interests of the two companies gives the latter company entire control of the manufacturing as well as of the selling of the product. The same officers were re-elected, viz., J. W. Tierney, president; R. T. Mickle, vice-president; J. H. Mickle, secretary-treasurer. The Philadelphia Pneumatic Tool Company has recently placed orders for a number of special machine tools for their shops. They have also opened an office recently in Pittsburgh at 1 Wood street, in charge of Mr. John K. Henry. Heretofore they have been represented in that city by an agency only. This company expects to open an office in Chicago at an early date. Mr. J. Wilbur Tierney, president of the company, sailed for Europe on February 6, to look after foreign connections of the company.

The American Bridge Company made larger sales during January than in any other month since the organization, aggregating over 60,000 tons.

Such vigorous protests have been made over the Rock Island arsenal recommendations that what is claimed to be the fiercest war ever waged in such a field is going on.

Reports heard from a few machine-tool men indicate no great change in the business situation; yet at one house is noted a manifest improvement in the market although the orders received are small ones individually.

CHICAGO MACHINERY MARKET.

There is improvement in the Western machine tool trade. Whereas there were good reports concerning business by a few sellers a month ago the same kind of report now comes from the many. Orders for February are better than for January and trade for the latter half of January was better than for the first half. But the best side of the machine-tool trade is that relating to the future. The inquiry is considerably more satisfactory than actual business. It includes quite a number for large lots. The railroads are among the best buyers and inquirers. The Union Pacific has asked for bids for tools amounting to about $40,000, it is stated, and other railroads are almost equally diligent in preparing to refit their shops with modern tools. The advent of the modern 50-ton car in Western railroad service among the old wooden rolling stock is said to be demolishing the latter at a rapid rate and shop repair is in consequence increasing rapidly. Some of the old tools that are being discarded from the railroad shops are of a pattern so antiquated that they are going directly to the scrap pile. There has been of late a more generous appropriation for machine-shop supplies and the master mechanics are improving their opportunities.

In January the activity in woodworking machinery was relatively greater than in iron-working machinery. In February the latter has made gains upon the former, but the woodworking machine-tool trade has not decreased. One large seller reports January business 10 per cent. greater than for January last year, while the number of orders increased 25 per cent., thus showing a more general distribution of the buying. The Berlin Machine Works are running until nine o'clock at night and are sold up for six months.

In Chicago, telephone factories have been among the best buyers of machine tools. Development in that industry has been very rapid here, and it is said that fully 60 per cent. of the telephone production belongs to the city.

Rudolphi & Krummel are running full time and on some of their sizes are running behind. Among orders recently placed by J. B. Doan & Co. is the equipment of the Ishpeming (Mich.) Manual Training School with an outfit of machine tools.

The machine-tool firm of Dawson & Goodwin has been dissolved, Edward D. Goodwin retiring. The business will be continued by John H. Dawson.

Among recent Western orders from manufacturing plants taken by E. P. Allis Company is a 600 horse-power engine from the W. W. Kimball Co., Chicago.

The Buckeye Engine Company has sold a 250 horse-power compound engine to the Republic Iron and Steel Company; two of 600 horse-power to the Dayton & Troy Railroad, Dayton, Ohio, and one of 400 horse-power for Ashland, Ky.

Abendroth & Root Company report business in January larger than any month for years. The Oil City Boiler Works have secured the contract for boilers of 1,200 horse-power for the electric lighting company of Peoria, Ill.

Quotations.

NEW YORK, Monday, Feb. 18.

A report has been heard to-day, said to emanate from inside sources, that the United States Steel Company has been formed, with $650,000,000 capital. The steel markets we quote are strong, particularly for quick deliveries, and higher prices are expected.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:

No. 1 X foundry	$15 65 @ $16 50
No. 2 X foundry	15 25 @ 15 50
No. 2 plain	14 50 @ 15 00
Gray forge	13 50 @ 14 65

Alabama Irons:

No. 1 foundry, or soft	15 00 @ 15 50
No. 2 foundry, or soft	14 50 @ 15 00
No. 3 foundry	14 00 @ 14 50
Foundry forge, or No. 4	13 50 @ 14 00

Bar Iron—Base sizes—Refined brands, mill prices on dock, 1.50 @ 1.60c.; from store, 1.75 @ 1.80c.

Tool Steel—Base sizes—Good standard quality, 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. upward.

Machinery Steel — Base sizes — From store, 1¾ @ 2c.

Cold Rolled Steel Shafting—Base sizes—From store, 2½ @ 2¾c.

Copper—Lake Superior ingot, 17c.; electrolytic, 16⅝c.; casting, 16½ @ 16⅝c.

Pig Tin—27¼c., for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4⅜c., with .02½ extra for carloads.

Spelter—4.05c., New York.

Antimony—For 5-cask quantities Cookson's is about 10½c.; Hallett's, 9c.; Italian, Hungarian and Japanese, 8¾c.

Lard Oil—Prime city, in barrel lots, 65c.

Valve Seat Facing Machine with Combined Driving and Feeding Gear.

The accompanying illustrations show, in plan and section, a new mechanical movement as applied to a valve seat facing machine. Fig. 1 shows a section of a valve face with steam chest cast to the cylinder, *a* being an end mill feeding in the direction of the arrow. The spindle carrying the mill is mounted in a traveling head, and is driven by a worm gear, as shown in Fig. 2, the worm gear being driven by two worms, one on each side, geared together at *b b'*. It will be readily seen, if the two gears *b* and *b'* are of the same size and the worms of equal pitch, that the worm gear will rotate without feed, but if the gear *b* is larger than *b'* and worm *c* rotates faster than *c'*, that the worm gear will not only rotate, but be fed along at a rate faster or slower as the difference in the sizes of the gears is greater or less. In other words, the driving worms become the feed mechanism as well.

To return the traveling head for another cut, it is only necessary to remove gear *b* and apply a crank to the end of the worm, which, being of coarse pitch, moves the head back very quickly. By substituting a gear in the place of *b* with the same number of teeth as *b'*, the worm gear simply rotates; then, applying the crank to the cross-feed screw *d*, the carriage is moved along so as to set the end mill ready for another cut. A clutch in the pulley *e* enables the operation to stop instantly by simply pushing in the knob *f*.

The machine was designed by John E. Sweet and built for W. B. Cogswell, of the Solvay Process Company, of Syracuse, N. Y.

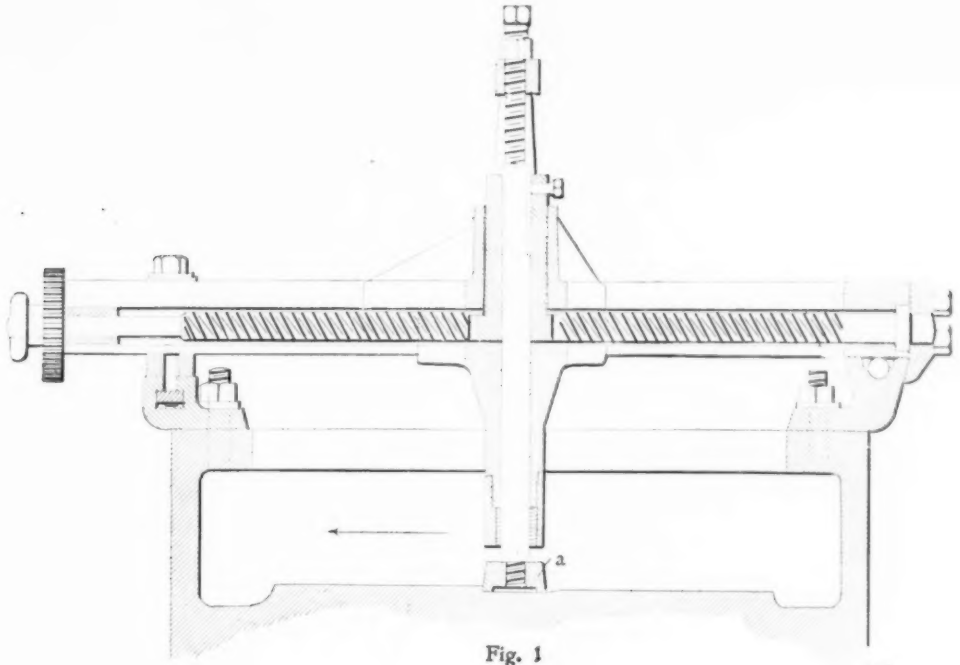


Fig. 1

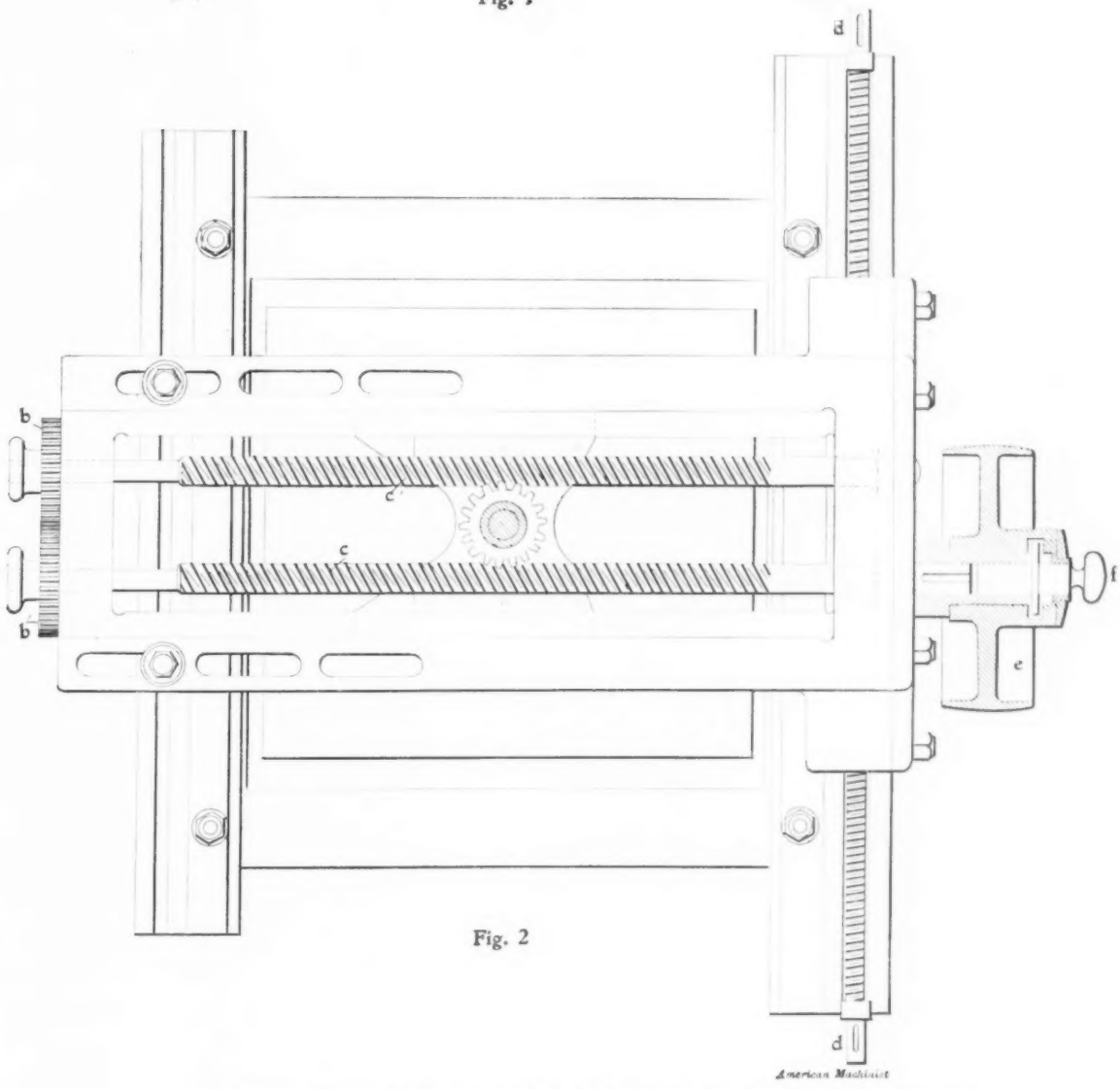


Fig. 2

COMBINED DRIVING AND FEEDING GEAR APPLIED TO A VALVE SEAT FACING MACHINE.

Molding a Grinder Bed.

We take great pleasure and experience considerable satisfaction in being able to present to our readers the following account of a novel and interesting molding operation. It will be of interest not only to every molder, but to many others who seldom look inside a foundry. The half-tones give us a peep into the foundry of the Landis Tool Company, at Waynesboro, Pa., and show the construction of the mold for the frame or principal casting for one of their grinding machines.

The casting, the molding of which is here shown, was formerly molded in the "regular" way, having the pattern in halves and molding half in the cope and half in the drag. Great trouble was experienced in drawing the patterns satisfactorily, as well as in venting the mold, to make the castings free from scabs. The patterns required also were much more costly and elaborate, as it was necessary to make each in a number of pieces, so that everything could be drawn without breaking the mold. By the method here shown a pattern is used which is solid throughout, or in one piece, guaranteeing the reproduction of the exact form in the casting, and by molding with a very thin layer of sand the tendency to swell is mostly overcome. By this method, since the flasks are so thoroughly perforated, the necessity of wire venting is also avoided, as well as the handling of the large quantity of sand otherwise necessary. All these conditions combine to make the molding a much shorter job than before, the work being actually done in less than half the time.

The method here shown originated in the works where it is so successfully employed through the consultation and cooperation of Mr. A. B. Landis, the superintendent of the works, with the foreman patternmaker. It is scarcely necessary to say, as Mr. Landis does, that the method adopted would not be exchanged for any now known, and, without exception, all the grinding machine beds turned out are molded in this way, with complete outfits of single-piece patterns and iron flasks.

The flask, as will be seen from the half-tones, is not quite as simple as the old-fashioned type, where one piece is simply piled upon another. This consists of a bottom piece, two side pieces, each side in two sections, and two end pieces, all hinged to the bottom piece, and a cope or cover. The sides and ends are perforated all over, as shown, and the layer of sand around the mold is only from 1 to 2 inches thick. The corners of the flask are bolted together and the top is bolted on. When the bolts are taken out, the sides are let down like the covers of a book, and the pattern is lifted off the base without any drawing, and it is not subjected to the disintegrating process of rapping. The partings of the mold are formed upon the corners, and as the flask sides close up again precisely as before the pattern was removed there is no perceptible fin, and especially no shift, thus leaving the smallest possible amount of work in finishing the casting.

The half-tones, from excellent photographs, tell the story of the molding so clearly that only a little explanation is really required.

Two dry-sand cores are employed; one, which is made on a cast-iron frame or skeleton supported by the perforated bottom and resting on the lower frame of the flask to which the sides are attached, is used for shaping the top of the bed, which, as is understood, is molded with the top side down to secure solid metal where most required for planing and finishing. The other core is for the inside of the bed. The core is the same hight as the pattern, there being no print in the cope. It is simply supported by the cope, which is heavily barred to prevent any rise of the core, the cope being, as previously stated, securely bolted to the sides.

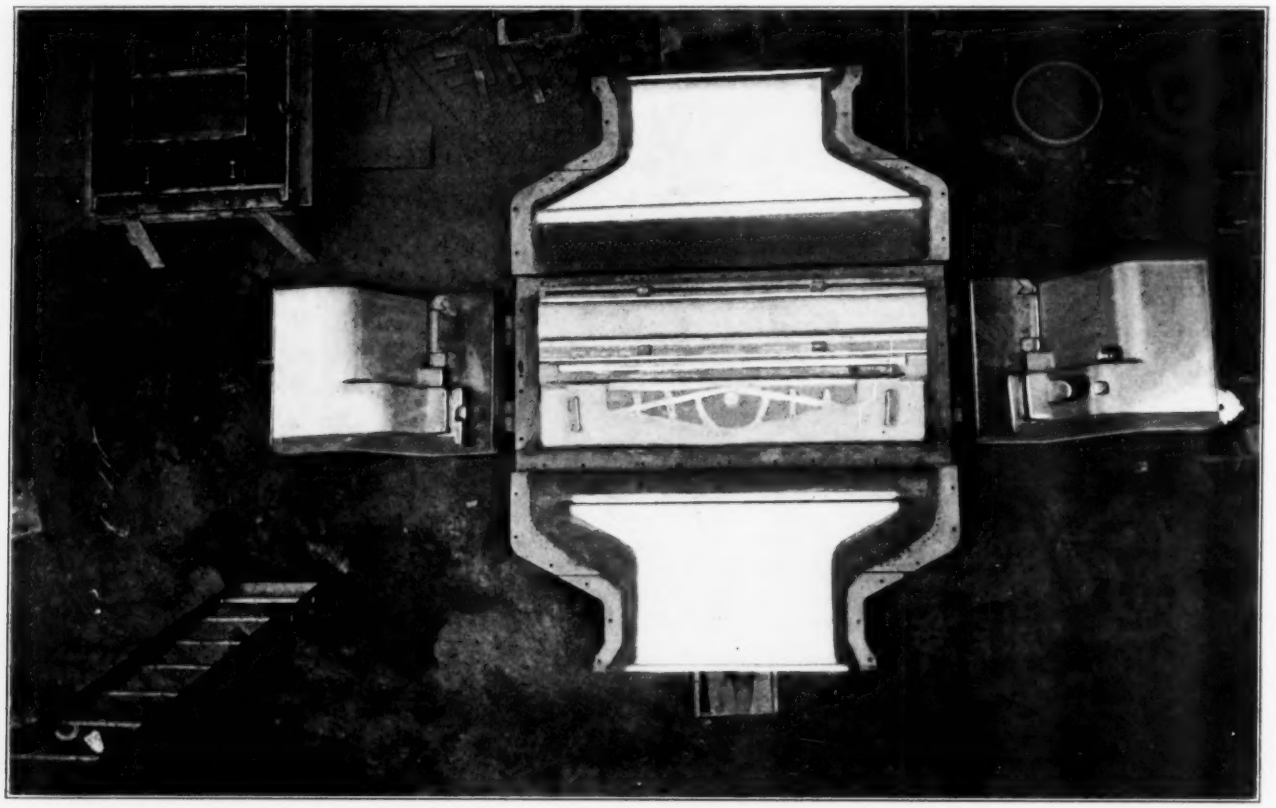


FIG. 1. MOLDING A GRINDER BED. READY FOR THE CORE.

Quite possibly, in first looking over the half-tones, the question arises as to how the mold is rammed up, but this difficulty vanishes quickly. The first operation is to place the bottom core on the flask, set the pattern upon it, lock up one side and the two ends, put on the cope and turn the mold over upon the closed side. The two ends are then rammed up through the exposed side, or what might be called the edge of the sand. When this is completed the flask is turned back to its normal position, the top sections of the sides are removed and both sides are rammed up as far as they can be. The upper sections of the sides are then bolted on

FIG. 2. THE CORE HOISTED.

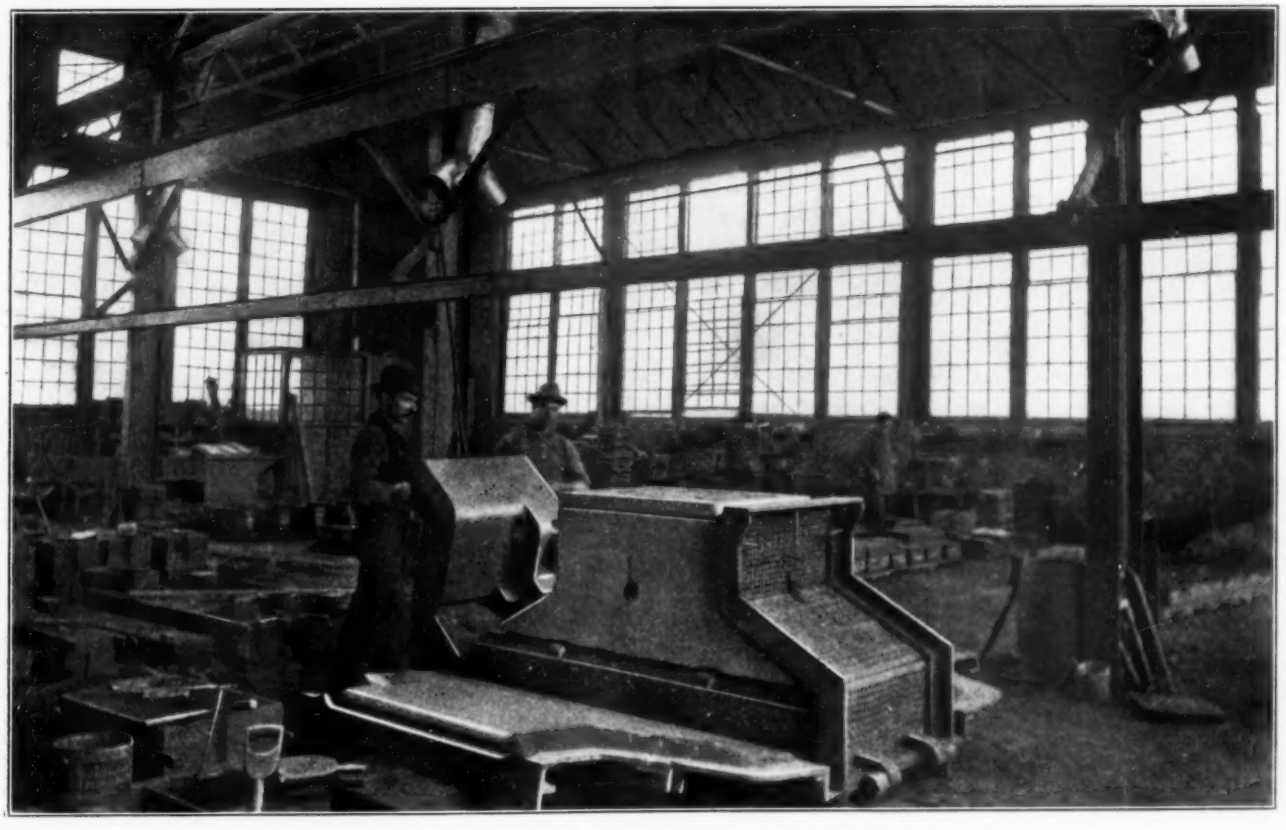


FIG. 3. CORE IN POSITION. CLOSING THE MOLD.

and the ramming of the sides is finished.

The mold is now opened, as shown in Fig. 1, and the sides are dressed and blackened. This view is taken from above, looking down upon the foundry floor and the mold. When the finishing of the surfaces is completed the core is placed in position, the sides are closed up, the core is keyed under the cope bars and the runner box is placed ready for pouring. Fig. 2 shows the core being lowered into position. Fig. 3 shows the core in position and the molder closing the mold. Fig. 4 is the mold entirely finished and ready for pouring.

In pouring the bed the molten iron passes through gates in the core to the bottom of the mold. As the casting is molded bottom side up it insures clean surfaces for the parts of the machine which are to be finished. The time required to make one bed is as follows: Two men eight hours to make the two cores, one man eight hours to make the mold, and one man eight hours to remove the core and clean the casting. The results of molders' work are traditionally uncertain, and a considerable percentage of bad castings is habitually expected. We are assured that out of three hundred beds made by this method only two were lost. Not much closer results than this could be expected in machine-shop work.

As the top of the grinder bed is very irregular in form, dry sand is used for this surface. Then by pouring down through the gate in the main core, as described, the iron is fed at the bottom on the hard surface, thus preventing washing. Another advantage is that, as the cope of the flask forms the bottom flange of the bed, this surface can be made perfectly true and a casting is produced which sets evenly upon the floor, whereas, by the too familiar method of molding upon the side, these flanges have always to be slightly tapered to facilitate the drawing of the pattern and the setting of the core often somewhat spoils the edges.

FIG. 4. MOLD READY FOR POURING.

The Paris Exposition—XVIII.

A LATHE MILLING MACHINE.

When looking about the workshops of Europe in 1897 I visited the factory of the Woolsely Sheep Shearing Machine Company, at Birmingham, and made the acquaintance of H. Austin, the superintendent, a man of ideas and an excellent mechanic. He had put in quite a lot of American machine tools, which he was running mostly in a room by themselves, turning out bicycle parts—a business which at that time was booming in England. He had considerable fault to find with American tools, and was making the mistake, so often made in Europe, of judging all tools made in America by the particular examples which he happened to have in his place. This was not fair to American tool builders, although Mr. Austin did not know that, for he evidently thought the tools he had were as good as any built in America.

At that time he had himself built some tools for use in the factory, but, I believe, had made none for sale. Since then, however, stimulated perhaps by his more or less unsatisfactory experience with the American tools, he has brought out some of his own design, and quite a number of them were shown at Paris. In doing this he has not copied American designs at all, though evidences can be seen here and there that American ideas have had their influence with him, as would naturally be expected. One of the tools exhibited at Paris is shown at Fig. 159. I saw a number of these machines in use in the Birmingham factory in 1897, and Mr. Austin was quite enthusiastic in praise of them as manufacturing tools. The machine is both a lathe and a miller, but both of its functions are of course limited to manufacturing operations and what is known in Britain as "repetition work." It is called by the makers a "7-inch lathe milling machine," and it is declared that these machines are not so often idle in the factory of their builders as many other machine tools are, because they can be so readily used either for turning or milling as the work may require. It will be seen that the machine is much like a lathe of English design, but the carriage is entirely different. It has no apron and is moved along the bed by the hand-wheel seen at the left, instead of by the usual wheel attached to the carriage. There is an automatic feed for the carriage, which I think is by a screw working through a nut permanently attached to the carriage. The tool-post,

which is of the American style, is held in a block which attaches to the platen by means of the T-slots, and this platen is adapted to receive the various fixtures used in milling.

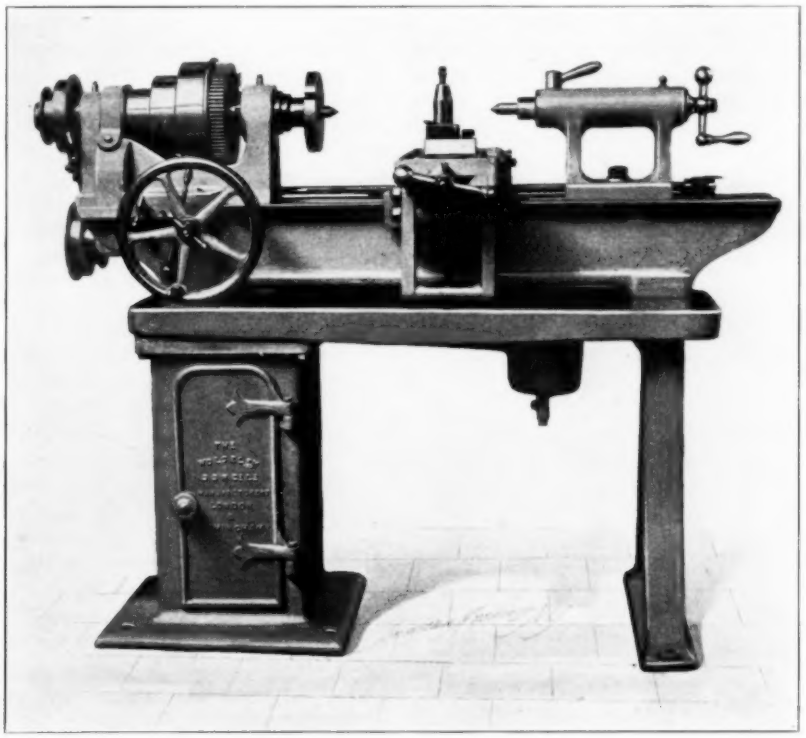


FIG. 159. LATHE-MILLER SHOWN AT PARIS BY THE WOLSELEY SHEEP SHEARING MACHINE COMPANY, OF BIRMINGHAM.

For milling, it is of course necessary to provide some means of vertical adjustment for the work, and that is what the rectangular frame arrangement on the front of the carriage is for. The threaded rod which projects downward has two nuts on it, by means of which the hight of the platen is adjusted, and when fixed it is clamped in position by bolts which pass through from side to side above. A special headstock is supplied with the machine which goes on to the bed in place of the footstock seen on it, and this special headstock makes of the machine a double miller, it having a spindle adapted to drive cutters and a suitable pulley. To me it is a little curious that a man who shows so much originality as Mr. Austin does in most of his work should have put on to this footstock an American style of balanced crank-handle, and that he should not at the same time have otherwise departed from the style of a footstock which has been almost universal in England and still is largely in use there, but which seems to me to be about the worst thing that could possibly be devised for the purpose. The footstock of this machine, for instance, has to resist forces which are applied to it in a great many different ways, and it seems to me that the metal of which it is composed is so arranged as to make it as little able to withstand these stresses as possible. For instance, a force tending to push the tail-spindle backward (to the right) is resisted by the two flat, relatively thin, parallel uprights with neither diagonal brace nor connecting web. It is subjected to twisting forces, and its metal is as illy disposed to resist them as it could well be. It is subjected to forces which tend to tip it over toward the front or back, and these forces must be resisted by a single bolt which is placed in the middle of the very narrow base; the force having a leverage over the bolt of about 4 to 1. It is subjected to forces tending to lift it up from the bed in front and to tip it over to the right with the lower right-hand edge of its base as a fulcrum. The distance from this corner to the binding bolt and from the binding bolt out to the end of the center, as seen in the photograph, will give a very vivid idea of the advantage this force has over the bolt. Of course Mr. Austin is not responsible for it. It is simply one of the time-honored institutions of England, and is a good example of how to make the heaviest possible footstock in proportion to its strength and stiffness or the weakest possible footstock in proportion to its weight.

The machine has of course an automatic cross-feed and the feeds of both the carriage and of the cross-slide are provided with automatic releasing devices that work in either direction. The spindle is hollow and is ground with straight bearings running in fosfer-bronze boxes, which are tapered externally and split for adjustment by means of the usual threaded rings.

A MANUFACTURER'S LATHE.

In the way of a lathe for manufacturing purposes Mr. Austin's ideas are shown by Fig. 160. The headstock is seen to be the same as is used on the machine last described and there is a better footstock, which is clamped to the bed by the lever seen projecting at the rear. Though this is not a gap bed lathe the one-sided carriage is used which is made necessary by a gap bed and which has therefore become sanctioned in British practice, even in cases where there is no need for it, as in

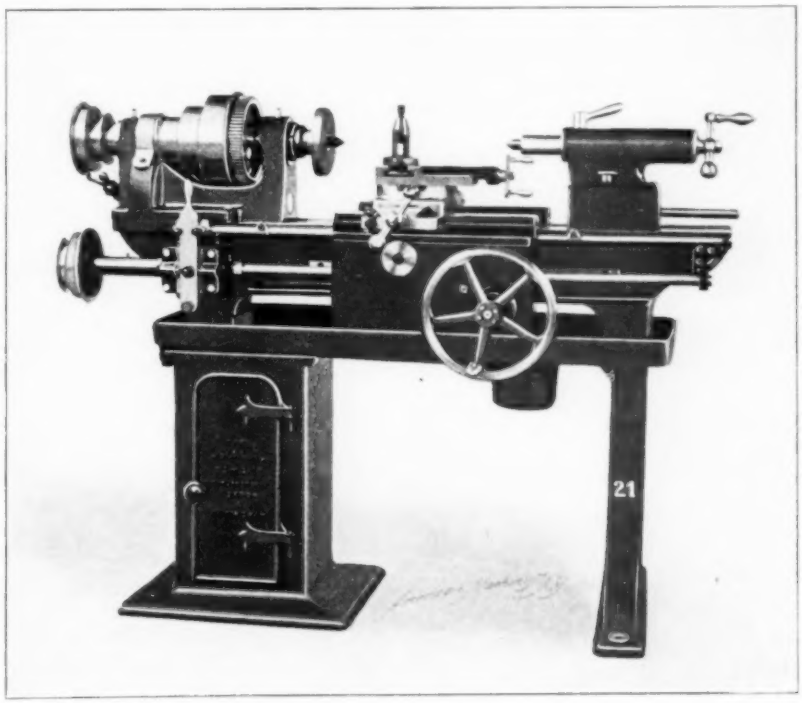


FIG. 160. AN ENGLISH MANUFACTURERS' LATHE.

this one. Our idea is that the cross-slide of a carriage should be in the middle of the carriage so that it is supported equally on either side and this is undoubtedly true for practically all turning operations. But when it comes to boring where the work is held in a chuck or on the face-plate and the tool in the post, then undoubtedly it is better to have the carriage support extended forward further than to the rear, and

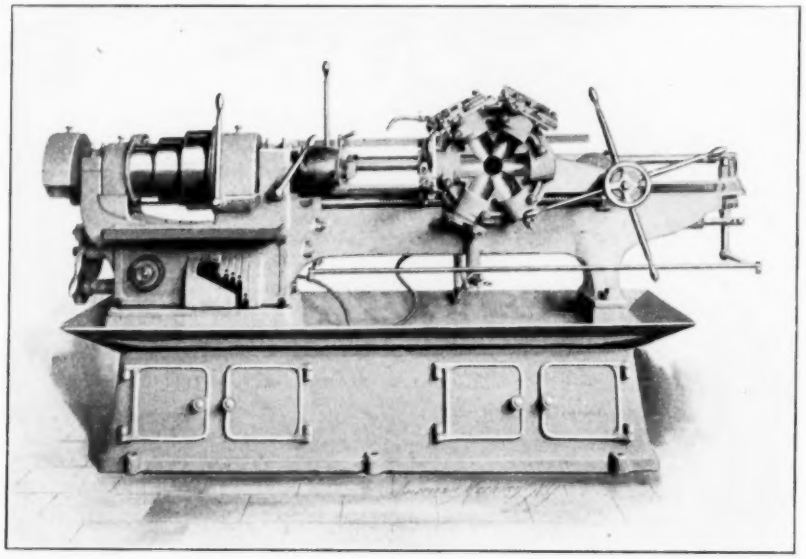


FIG. 161. FRONT VIEW OF 2½X24-INCH VERTICAL TURRET LATHE SHOWN AT PARIS BY THE WOLSELEY SHEEP SHEARING MACHINE COMPANY.

in fact American lathes are not entirely unknown in which this has been done for the purpose of thereby better supporting boring tools; or, in other words, bringing the line on which the stress of the cut is applied nearer the center of the carriage bearing. Then the hand-wheel by which the carriage is moved upon the bed of this lathe is on the wrong side according to our notions. I mention these points, not as a criticism of the lathe, but to call attention to the fact that a man whom I believe to be a good mechanic and a close student of machine tools and of manufacturing operations deliberately chooses these points of construction in tools built for the British market and does it after considerable study of our designs and with at least some experience with our tools.

The lever seen at the left of the headstock is for throwing the back gears in or out; they being placed under the cone pulley. The lever in front of the headstock is for reversing the feed; which may be done by hand or automatically.

A TURRET MACHINE.

At Figs. 161 and 162 front and rear views of a turret machine are given, which machine is intended for about the same class of work as the Hartness or Jones & Lamson flat turret machine is designed for. This machine enjoys the distinction of having pieces of its work that required a total of 3 hours 30 minutes to make, officially declared by the United States Government to be worth $15, on which the "American Machinist" was asked to pay 45 per cent. duty, or $6.75. Mr. Austin had sent them over as samples of the work the machine is capable of doing. These samples consist of one square-threaded screw 1 inch diameter and 21 inches long, double thread, 4 per inch, made in 90 minutes; one square-threaded screw ⅝ inch diameter, 15 inches long, single thread, 10 per inch, made in 50 minutes; one worm shaft 1¾ inches and ¾ inch diameter, 24 inches long, made in 50 minutes, and one worm shaft 1¾ and ¾ inch diameter, 24 inches long, made in 20 minutes. They were exactly as they had left the machine and of course would be of no practical use here except to look at. After some months of delay a decision was finally obtained under which the pieces were delivered free of duty as "samples of no value."

They were made from "black bars" and certainly do show that the machine is capable of doing excellent work, also that the tools used on the job were well made and in good condition.

This machine, or one very similar to it, was described and illustrated by "The Engineer" in its issue of October 6, 1899, and from that paper I have copied the drawings, Figs. 163 and 164, which will help to an understanding of the points of the machine, notwithstanding that some changes have been made since that date, notably in the arrangement of the turret stops. In the first place it will be noticed that the bed is very much narrower than would be sanctioned by American practice and that it is flat on top with beveled edges and a gib for the turret slide—all in accordance with regular British practice. It will be noticed also that the turret slide or carriage is very long and that the gib is arranged in a very superior manner. The turret which is designed to hold tools similar to those used by the American machine already referred to overhangs the bed and is vertical instead of being flat and placed on top of the carriage. It would be interesting to reprint our British contemporary's description of this machine, but considerations of space prevent. It starts out as follows: "It is very pleasant to be able to put before our readers a purely English machine tool, which we have no hesitation in saying is in no single point behind the best American practice, and is in some ways superior to any other tool of foreign or British make doing the same class of work."

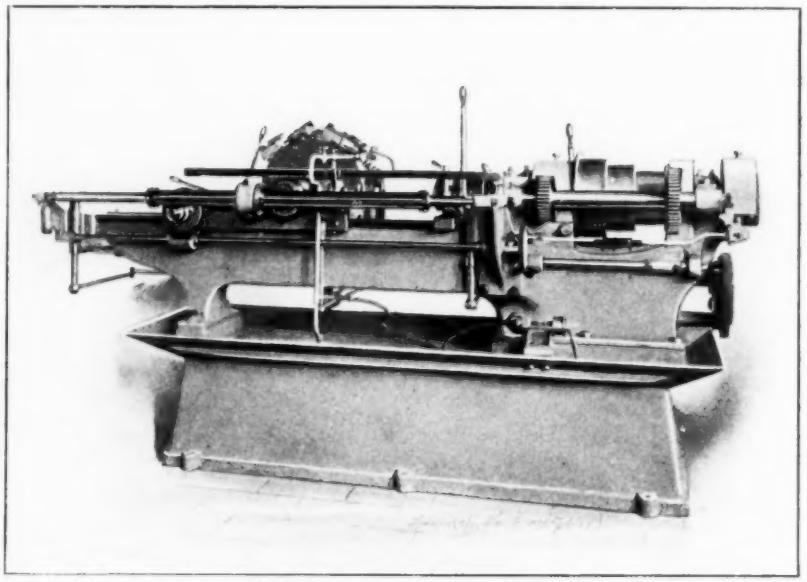


FIG. 162. REAR VIEW OF 2½X24-INCH VERTICAL TURRET LATHE.

This will be recognized as a pretty bold statement, and it certainly makes some claims that Mr. Austin would not himself make for the machine. In the first place,

it may be said that the chuck and the roller feed for the bar are essentially the same as have been in use here for a long time and are thoroughly covered by American patents; though perhaps these facts, familiar of course to Mr. Austin, would not be considered by our esteemed contemporary as upsetting its characterization of the machine as "a purely English machine tool." One of the points of superiority claimed by "The Engineer" is that "the stops are so placed that they can be got at with the greatest ease, and that they are in direct line with the cutting tools." Now, Figs. 163 and 164 show how nearly the stops are really in "direct line with the cutting tools." If there is an American machine in which the stops lack so much of being in direct line with the cutting tools, I do not know of it, and do not believe that one is built here. The designer of the machine of course knows better, but the writer of the article referred to must have thought that, so long as the stop was placed at the same hight as the spindle of the machine, its distance from the vertical plane passing through the spindle did not count for anything. It will be instructive perhaps to consider what really does take place. We will suppose the machine to be taking a cut and the turret slide being fed forward by the rack pinion which is in the middle of the bed. The resistance of the tool will be such that all lost motion of the slide upon the bed and of the turret pivot within its bearing in the carriage is taken up in one direction—contrary to the hands of a watch. Now, when the stop comes into contact, it is evident that the tool can still advance until all this lost motion is taken up in the opposite direction, because the point of contact of the stop becomes the resisting point and the one about which, as a center, all further motion takes place until all lost motion is taken up. How much the lost motion will amount to, of course, depends not only upon original construction, but also, and perhaps mainly, upon how well the machine is looked after and kept up. In the American machine with which this one will inevitably be compared, the stop is probably not over one-third as far from the center line, and is in the same vertical plane with the spindle, so that no "slewing" action takes place by reason of it; the index pin (which the writer of "The Engineer" article says is called in America a "locating pin") is entirely covered up and protected from chips and dirt, as are also the index holes; and when cutting, the turret is clamped to the saddle by a clamping ring which passes entirely around the turret near its periphery, and is automatically closed before cutting begins.

Of course I have not the least doubt that Mr. Austin has a good reason for every feature of his really excellent machine, and what I have said above is intended only as a criticism of what I consider to be a foolish article in "The Engineer" rather than of the machine.

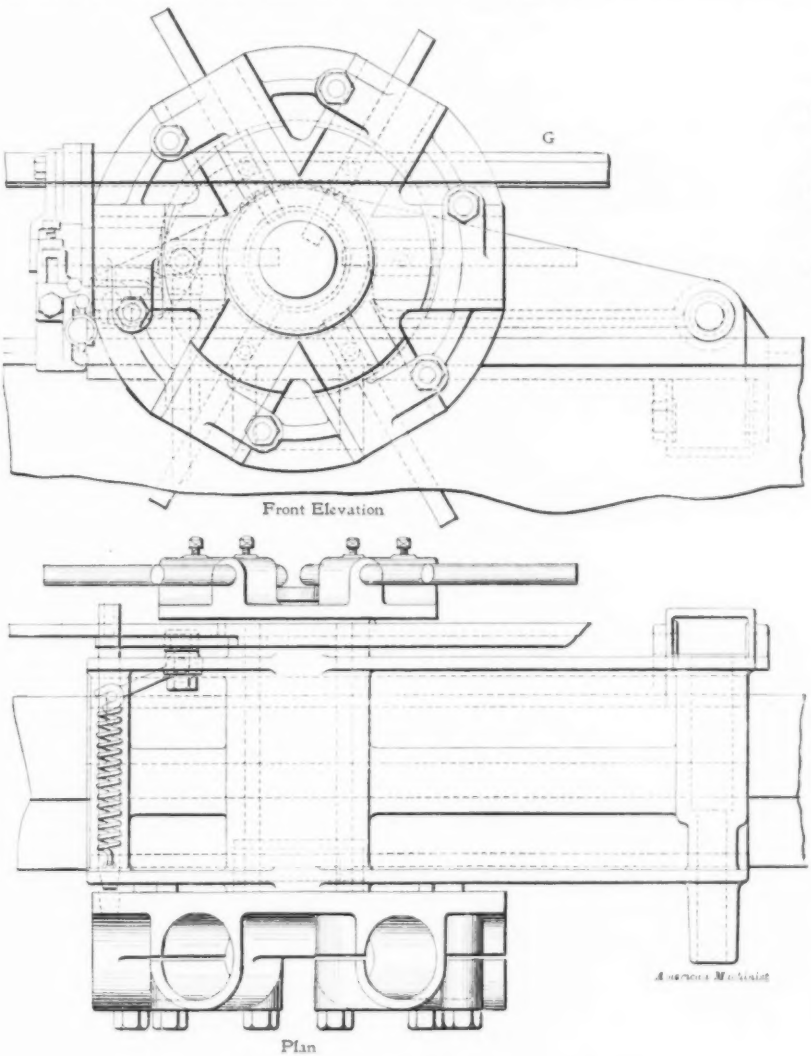


FIG. 163. PLAN AND ELEVATION OF TURRET.

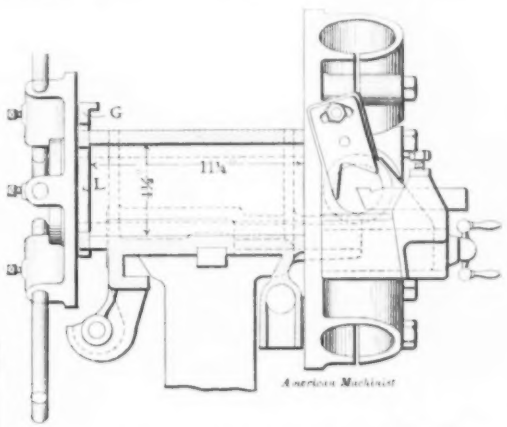


FIG. 164. CROSS-SECTION OF TURRET.

What is claimed in favor of this construction is that the long, curling chips usually made by machines of this class do not fall upon the turret and impede its action so much as is the case with the flat form—that the chips and tool lubricant fall directly into the large pan underneath and that it is therefore more practicable to use "soap-suds or other cheap lubricants" (which our best informed men do not believe in using on such machines); that the cutting tool is quite close to the operator, where it can be more closely and conveniently observed or adjusted by him, and that the stops, being in the same line of vision as the tools, it is convenient for the operator to always know just how far the tool has yet to cut before the stop contacts.

Reference to Fig. 162, which is a rear view of the machine, will show the present arrangement of the turret stops. A bar is supported in bearings at the rear of the machine, which bar has six T-slots running lengthwise in it and these slots carry adjustable stops. In a bracket a bevel gear is carried, which gear slides over the stop bar with the motion of the turret and is also rotated with the turret. There are five slots through the gear and these permit five of the stops to pass through the gear, but the sixth stop cannot pass through and therefore arrests the motion of the turret slide. The stop bar also has an endwise motion to positive stops in both directions and this motion first throws out the automatic feed and is then transmitted by the mechanism at the

end of the bed to the turret locking-pin and to the rack by which the turret is rotated. The arrangement for rotating the turret is entirely different from that of any American machine. On the turret axis is a spur gear *L*, Fig. 164, and above this is a rack *G*, which normally is held upward out of engagement with the gear, but at the proper times it is automatically thrown into gear and thus causes the necessary rotation. I assume that the feed-varying device is essentially the same as the Norton.

It will be noticed that, in addition to the rack-and-pinion feed, there is a screw in front, as near as possible to the cutting tool, by which the turret may be fed when cutting threads that must be accurate to pitch or where for any reason the die cannot be depended upon to maintain accurate lead.

It will be conceded, I think, that this tool shows a great deal of originality of design and that it has a good many good and interesting features about it.

The same company also exhibited an automatic screw machine having novel features, but as I have no photograph of it, I am unable to publish an illustration. In general appearance it somewhat resembles the Hartford or Spencer machine, having below the spindle the same cam shaft from which all the motions are derived in the same manner, and change gears are provided by means of which, when the turret has, say, four holes, and only two of them are needed for the job in hand, the cam shaft is given motion at a rate adapted to this and the work thereby accelerated.

The turret itself is not like the Hartford, but more like Cleveland machine, being a cylinder with its axis horizontal and parallel to but offset from the spindle axis sufficient to bring the tools successively into line as the turret is rotated. The turret thus forms its own bearings on which it rotates and slides longitudinally for the feed. F. J. M.

Mechanism for Boring Elliptical Cylinders.*

BY PROF. C. W. MACCORD.

In the use of the "elliptical chuck," as is well known, the cutting tool is fixed at a definite distance from the axis of the lathe, and the piece to be turned receives a compound motion by which the desired form is produced. Of course the slide rest, carrying the tool, may be given a longitudinal feed, and thus a cylinder, provided it be not very long, may be turned to an elliptical section, either externally or internally.

But to this arrangement there are some serious practical objections, which limit its capacity to a quite narrow range.

The very fact that the whole work has the compound motion spoken of prevents it from being supported on the back center of the lathe; the elliptical chuck, which is screwed upon the nose of the headstock mandrel, is itself provided with a nose, upon which is screwed in its turn a common chuck, within whose jaws the work is gripped and held, necessarily by one end only. Even in outside turning, the work is liable to spring away from the tool if the piece be of much length; if it be heavy, this liability is increased by the overhanging weight, which also throws an injurious strain upon the mechanism of the elliptic chuck itself. In inside turning, one is confronted not only with these difficulties, but, if the hollow cylinder be of more than very moderate length, with another one, due to the fact that the tool must project from the slide rest to a distance equal to the depth that is to be bored, so that "chattering" is very likely to occur. And in either outside or inside turning, there is one serious drawback, aside from those mentioned, in the circumstance that the piece operated on is not in running balance; which tends to impair the smoothness and steadiness of movement so desirable in the execution of fine and accurate work.

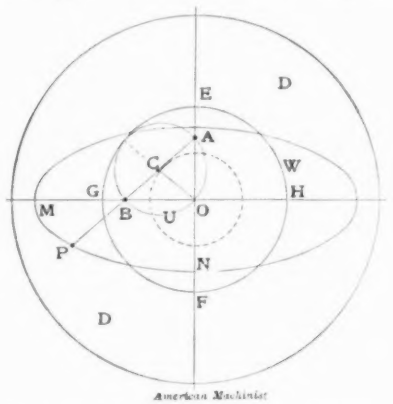


FIG. 1. MOTIONS BY WHICH AN ELLIPSE IS PRODUCED.

Now, it may be said that the necessity of boring such a cylinder is very unlikely to occur; and this is probably true. But should it ever be found desirable, it is also true that mechanism would also be desirable, to which the objections above enumerated should not apply. And, leaving the matter of utility out of the question, there may be some to whom the solution of the problem will be of interest, if only as an abstract study in the application of mechanical principles. We propose, then, to show that an elliptical cylinder of any length can be finished inside by the use of an ordinary boring bar, turning in fixed bearings with uniform velocity, just as in the common way of boring a circular cylinder.

In Fig. 1, *W* is a circle drawn upon the disk *D D* about its center *O;* within this circle rolls another one *U*, of half the diameter, whose center is *C;* and this circle carries with it the line *A C B P*. Then the center *C* travels in the dotted circle, the point *A* traverses the vertical diameter *E F*, the point *B* traverses the horizontal diameter *G H*, and the point *P* traces upon the disk *D D* an ellipse, as shown; the semi-major axis *O M* being equal to *P A*, and the semi-minor axis *O N* equal to *P B*.

It is of course to be understood that the disk remains stationary while the smaller circle thus rolls within the larger; but the same result may be reached in a different way, as follows: Let the disk rotate about a pivot fixed at its center *O;* and let the circle *U*, still carrying the bar *A P*, also turn about *C* as a fixed center. Regarding *W* as the pitch circle of an annular wheel, it will drive *U* in the same direction with twice the angular velocity; the circumferences still move in rolling contact, and the motions of *A*, *C*, *B* and *P*, relatively to *D D*, are the same as before. In this case also, then, *P* will trace the original ellipse upon the rotating disk.

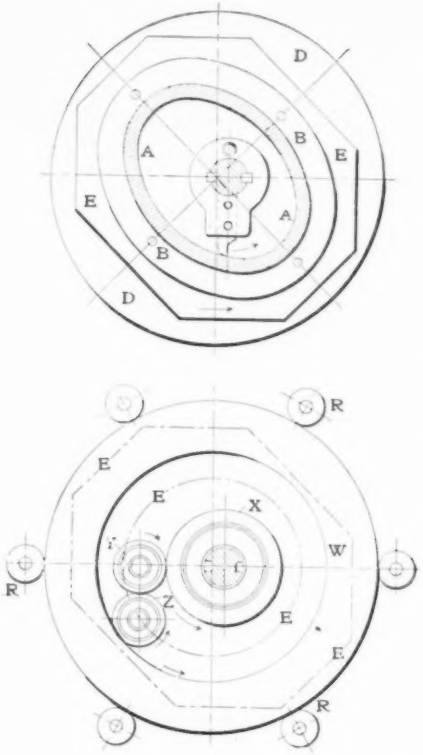
Now, let *O* represent the axis of the proposed cylinder, which is to be mounted on and carried by the disk; let *P* be the point of the cutting tool and *C* the axis of the boring bar which carries it. Then it will be seen that the interior will be bored to the true form of the ellipse shown; while the motions involved are simply those of uniform rotation about fixed axes, one of which is the axis of symmetry of the elliptical cylinder, so that the work is in perfect running balance, and steadiness in the movement is positively secured.

In relation to proportions to be observed in adjustment, it is to be noted that in Fig. 1, *C P* is equal to the half sum and *C O*, = *C A*, is equal to the half difference of the semi-major and the semi-minor axes.

Fig. 1 is of course merely a skeleton diagram to illustrate the principle, and Figs. 2 and 3 will serve to indicate means which might be adopted in practice, it being understood that no pretence is made of giving working details or proportions. In Fig. 2 is shown a horizontal section of an elliptical cylinder whose axis is vertical, with the boring bar and cutting tool in position. The cylinder *A* is to be secured by its flange *B* to a heavy bed-plate *E;* this is supported at some distance above the upper face of the heavy circular plate *D* (corresponding to the disk in Fig. 1), being secured to it and carried by it. The plate *E* has a large circular opening in it to permit the boring bar to pass through. This is shown in Fig. 3, where the form of this plate is indicated in dotted lines. Since the lower plate *D* must rotate and can have no central shaft, it must be supported beneath either by conical rollers or by spheres, which are not shown, and since its motion must be perfectly true and steady it is turned to a cylindrical form on the outer edge and confined by the symmetrically placed cylindrical rollers *R R*, whose axes are vertical.

This bed-plate *D* is in fact a broad rim for the annular wheel *W*, whose pitch cir-

*Stevens Institute Indicator.



SKETCHES FOR A PRACTICAL MACHINE FOR ELLIPTICAL BORING.

cle is exactly concentric with the outer circumference which runs in contact with the rollers *R R*. Upon the shaft of the boring bar is keyed a wheel *X*, whose diameter is one-half that of *W*. The two wheels *Y* and *Z* are of equal diameters and engage with each other, while *Y* gears with *X* and *Z* with *W*. These two wheels must be provided with fixed bearings and the shaft of either being driven by connection with the motive power, it will be seen that the cylinder and the boring bar will turn in the same direction, as indicated by the arrows, and with the relative velocities required, as deduced from Fig. 1.

Thus the boring is accomplished, as stated, by motions of uniform rotation only, the heavy cylinder merely rotating about its axis of symmetry. The rate of cutting is of course not uniform, but neither is it in the use of the ordinary elliptical chuck; nor is it possible to make it so, except by making the actual rotation of the lathe or of the boring engine variable. The best that can be done is to adjust the speed so that the maximum rate of cutting shall be the highest that the nature of the material will permit.

It is hardly necessary to add that since the distance between the axis of the cylinder and that of the boring shaft must always be equal to the half difference of the semi-axes of the elliptical section the bearings of that shaft and of the intermediate wheel *Y*, Fig. 3, must be adjustable in position, and the cutting tool is to be set so that the distance from its point to the center line of the shaft is equal to the half sum of those semi-axes.

Echoes from the Oil Country.

A FEW OF THE THINGS WE DO, AND HOW WE DO SOME OF THEM.

I have been looking over my old job books lately, and thinking that perhaps all of those at the business to-day don't know what we can do when we have to, I have made some extracts, adding enough to show how we do some of them. Our machine shop, you know, has a 28-inch by 16-foot lathe, a 24-inch by 8-foot lathe, a 24 by 24-inch by 6-foot planer, a drill press set on the bottom end of a post (the top end is up among the rafters and the bottom ends a few feet from the floor), and a pipe machine that cuts up to 2 inches.

Here is a little "Niagara" steam pump brought in in pieces. The owner couldn't make it run, tore it apart, couldn't find why it didn't run, bundled it into his wagon with the loose pieces in a grain sack, and here it is—orders: "Put it together and test it, repairing it as needed." That's a job for Sam. "Two flanges from sawmill to go onto a piece of 3-inch pipe; distance between faces to be 7 feet 10 inches." Joe will get that and do it in the 24-inch by 8-foot lathe. He will have to take off the tailstock and run the pipe in the steady rest, catch it in the chuck and thread up close and then cut it off. Of course, he will waste a little, but the long lathe is busy and he will have that string of 5⅝-casing to thread anyway, so he gets the job. He will use the original taper attachment, too, just feed it in by hand. It's for a steam line in a sawmill and it will be the right length and tight, too, when he gets through with it.

"Re-thread string of 5⅝-inch casing, nineteen joints." This is a job to make a new hand want to die or quit; 5⅝-inch casing is 5⅝ inches inside when new and 6 inches outside. Sometimes it is light weight or old, and then it is larger inside and apt to be pitted outside; the thread is 14 to the inch. To squeeze it in the chuck means to crush it, and then it has a very disagreeable habit of crawling endways that sometimes spoils the beauty of a thread. We use a bell chuck, just a sleeve casting with one end filled in small enough to take a thread so that it will screw onto the lathe spindle, and eight ½-inch set-screws in the other end. The set-screws are set quartering. About ¾ inch from the end of the bell four of them are set in and about 1 inch farther back the other four are set so that they stand between the first four. These all have cupped points and take a very good hold on a piece of casing. The sleeve is about 10 inches deep, so as to allow for ragged ends, but a pipe can be cut and by setting carefully only 2 inches be lost. By setting the screws in two rows the tendency to crawl is not so great and does not bother much, if you hold the far end of your pipe nearly right. You see, a hole in the wall, with a notched stick running across it and held at the right hight by a peg in the nearest right hole, is not exactly an instrument of precision, so you must keep awake. If you know enough to catch the tool post carriage with one hand and hold back all the slack while you follow in and out with the tool to keep the thread sharp on top, and if you see the pipe is crawling a little sideways and then knock your tool to keep up with it, you will get a pretty good-looking thread. Of course you will taper the last two or three threads down real small so they will start, and pull the pipe back round again, for it is apt to be anything but round when you cut it off. If it is too bad you had better screw that big collar on a little ways and pound back of the thread with a wooden block; when the collar screws off easy by hand, you are all right. It beats all how a piece of casing will twist and squirm when you take a cut off and go to thread it; and after you work and sweat and——, you finally get a thread you think will pass; then the tool drops into a pit, and you wish you had the measles or something. One thread every half hour is the work of an expert, while many would be well pleased to get one an hour.

"One 20-inch pulley, 8-inch face, 1 11-16 bore, ½-inch keyway; two ⅝-inch set-screws." When it comes from the foundry it will go to the 28-inch lathe.

"One spreader for saw, 18 inches diameter, with two boxes." That can go with the pulley to the 28-inch lathe.

"A house gas regulator to repair." That's a job for Billy, the all-round man.

"A gas pump to rebore and have ready by Friday night, sure." That's a job the boys all hate. The gas pumps used here are from 14 to 16 inches diameter and 24-inch stroke. They are used to suck the gas out of wells in some localities, and as they only have to stand the pressure of the atmosphere on the outside, they are made thin, and a man trying to bore one generally finds it has a tendency to spring out of shape on very slight provocation, making it extremely hard to hold without springing, by the means at hand in most shops. Incidentally, another thing is generally learned before the customer gets through with his part of the job, and that is that natural gas will flow freely out of a place that steam or water will not, and that air is not nearly so penetrating. So I must put the most careful and accurate man on this; and Walter gets it, with Joe to help him. They will have to hang on to-night for a few hours, as I can't spare any more help.

"Seventy hooks, from brass spring wire, same size we use to make pump valve springs." "Repair coffee mill at once, man waiting." "One hitching post: 2-inch pipe, 6 feet long, ring and bolt, plain top, coal-tar finish." "Whistle to fix." "Refit 3-inch cock." The lot all goes to Sam, also these next below, to help fill in the odd minutes: "A pump plunger for Innis's engine." "One steel set-screw, ⅝

inch, 11 thread, 3½ inches long, with jam-nut." "One 3-inch flue expander." "One punch like old one." "Two pulleys, 3 inches diameter; crown them well and fit to shaft furnished."

"Two tighteners for 8-inch belt. One saw frame and table with one flat and one 'V' rail; arbor with 4-inch collars, 1⅛ inch eye, left-hand thread; pulley, 7 inches diameter, for 6-inch belt. One countershaft, 1⅝ inches diameter, 2 feet between hangers; two hangers, 14-inch drop. One shaft, 1½ inches diameter, 4 feet long; one shaft, 2½ inches diameter, 12 feet long. Five 14-inch car wheels and two axles for track, 30-inch gage. Three boxes 1 inch longer than old one; holes for ⅝-inch bolts in boxes. Three bolts 1x19½ inches. One cast-iron block for hammering saws on, 8x5x4 inches deep, with handle in one end and top planed true. One pulley filled with paper. Twelve pieces track like sample. Six pieces cast rack, with two shrouded pinions to match same. Star engine to rebore and rebabbitt. Put in new head, rings and rod; round up crosshead pin; file up crank pin; put in new rod brasses; refit link; take up slack in eccentric straps, and round out holes and put in new pins wherever needed. Face valve and seat; put in new heater pipes; test with steam." This whole order, you see, will keep Sam out of mischief for several days, and he can work a handy man with him; it all goes to a sawmill nearby.

"Take hydraulic jack apart and see what ails it, and put in good shape." "Refit thirty-one 2-inch cocks to stand 350 pounds gas pressure." Billy gets these. He likes them both. That cock job is a nice one. I shivered, the first lot I saw; but Billy told me that was his job, and let me out. Some of the cocks will be frozen, so that the brass plug will be pressed into the openings of the shell (the shell is cast iron and the whole cock very heavy) so hard that a blow with the sledge is necessary to start it out. Billy will take hold, spend a few minutes with hammer and files and he is ready to grind. No machine work of any kind, and they are first class when done—in fact, many new ones are thrown out, not holding against the gas pressure, but I never knew one of Billy's to be thrown back on us after he had passed it.

"One 5⅝-inch casing die and one 2-inch pipe die to recut." These have inserted cutters and are a simple job when you know just how to do it; but they get some people into trouble. "One 3-inch butterfly valve." "One 5⅝-inch casing cutter with six extra cutters." This is intended to go down inside of the casing and cut it off at any place desired. It is turned by screwing on 3-inch pipe for a handle. The cutters are so arranged that they can be withdrawn after the cut is made, or they can be used to draw the casing, and the set of three must stand the pull of two jacks.

"One steel box with lock and key to fit in desk"—a sort of a safe with steel 3-16 inch thick. "Feed-cutter knives to grind." "Mowing machine to repair, put in first-class shape." "Cutter head for molding machine." "Empire engine to overhaul." "Cameron pump to supply missing parts." The parts we sometimes put in might surprise the makers, but as long as the pumps go we are satisfied. Solid piston valves are quite common, and solid poppet valves just the thing.

"Twelve springs, 7 turns, No. 15 brass wire, 1¼ inches long. "Twelve springs, 5 turns, No. 15 brass wire, 1¼ inches long." "One rotary pump, must be ready in one week." "Feed works for lathe mill to rebuild."

These are only a few of the varieties that we get. Many that come are jobs peculiar to this section and industry, and would not be understood without extended explanation and drawings; and some have very original sketches illustrating them that would be, I fear, worse than shorthand without the surroundings of the shop; yet enough is here given to show a little of our ways, and I can guarantee anyone tired of the monotony of one job for years that if ever he gets a job here he will have no more of that trouble. They say "variety is the spice of life," and there is lots of spice here.

W. OSBORNE.

Foundations for Machinery.

BY A. D. WILLIAMS.

Machine foundations are very often a source of trouble, not only in the designing, but when erecting the machinery upon them. The best construction is one in which all the bolts can be got at, not only on top but at the bottom. The neatest way to do this is by means of tunnels and manholes by which all bolt pockets can be reached. When the foundation is small this end can sometimes be attained by bolt pockets extending to the outside of the brickwork, which can be reached by digging if necessary. In the case of tunnels, it is a good plan to drain them, and this precaution should also be extended to wheel pits, etc., when possible.

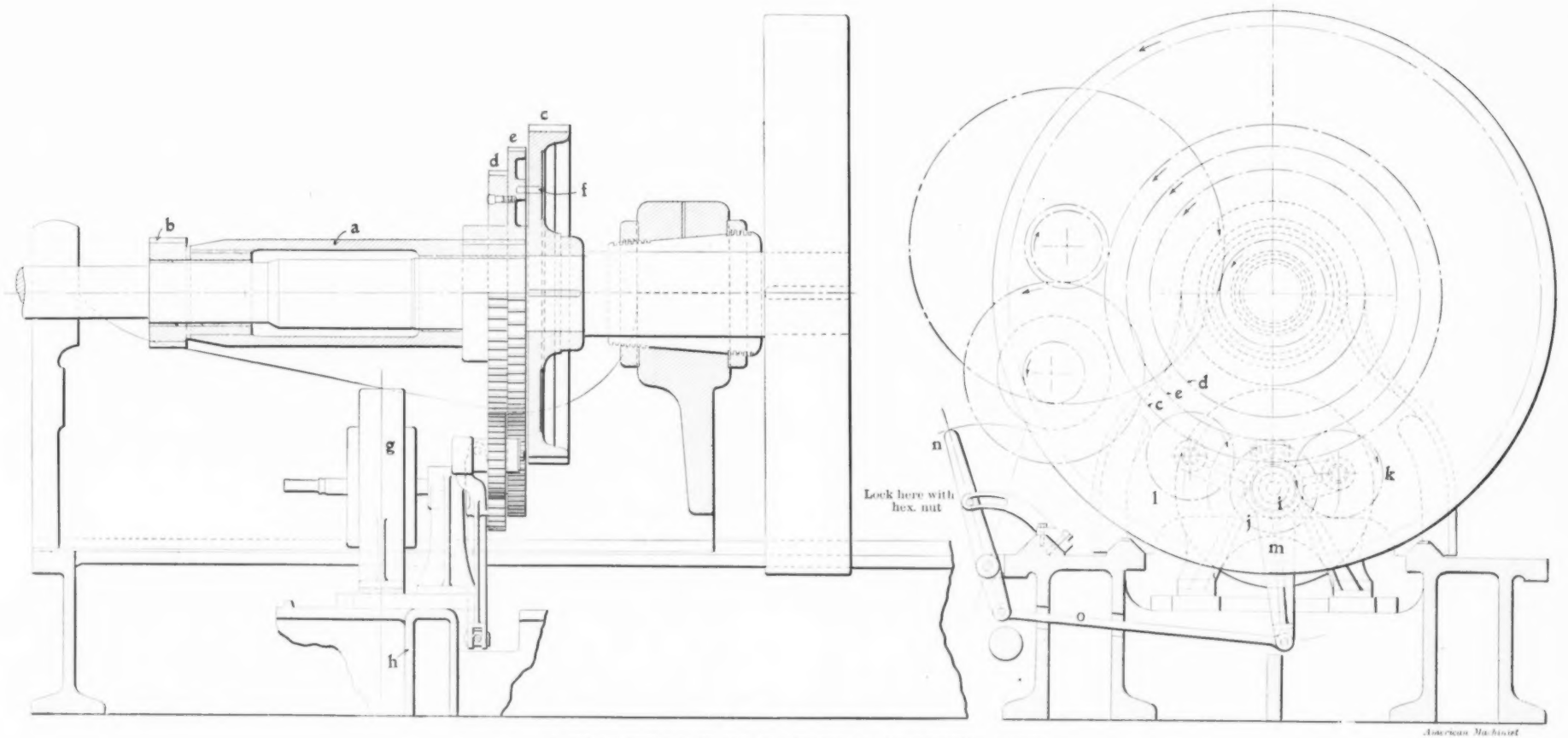
The laying out of this work is not a difficult matter, but calls for some experience in field work, to get the best results. When it comes to building the foundation there are several little things that can make the work of erection much easier. Accuracy in setting the templet is of course necessary, and it is a good plan to check this work thoroughly at the time of setting and during the progress of the work. The bolt pockets should be deep enough to allow the bolts to drop below the finished level of the foundation. This permits the placing of the bolts and then moving the casting over them, after which it is a simple matter to push the bolts up and guide them into position, and a little easier than fishing for the hole in the washer that cannot be seen. The bolt boxes (sometimes iron pipes are used, but wood is just as good, and easier to remove if necessary) should be much larger than the bolts, and never less than 3 inches square. This allows for final adjustment, and may save considerable expense, as an extra ½ inch in the box is cheaper than chipping out brick. These holes are later filled with sand to within an inch or two of the top.

It is a good plan to set the templet so that its bottom is at the level of the bottom of the bed plate; the brickwork is then stopped 1 or 1½ inches below this. The bed plate, having been placed on the foundation, is leveled up by wedges and got in line. The bolts are then set to hold it, and the boxes are filled with sand. A dam is now built all around the bed plate, and thin cement is used to grout between it and the foundation. After this cement has set, the dam is removed, the wedges are knocked out and the seam is pointed up and finished. With good cement, good brick, and bricklayers who know their business, a foundation can be put up that will give very little trouble. Below the brickwork there should be a bed of concrete, at least 18 inches thick and extending a foot beyond it in all directions.

In foundation work, local conditions govern, to a large extent, the amount of concreting and brickwork necessary. Concrete alone makes a good foundation, and, with the aid of boards and a carpenter, a mass of any shape can be built, tunnels and bolt pockets can be laid up in brick and the concrete laid over them very easily. The bolt pockets should never be less than 9 inches wide—more if necessary, as a little too big is not a bad fault in them. The brick for foundations should be hard, tough and sound; and roughness is not a bad quality, as it gives the cement a better grip. Vitrified brick and paving brick are useless. A good hydraulic cement should be used. This does not mean the most expensive, as some of the moderate-priced ones are very good; but it is poor economy to use the cheap grades.

In using cement some care is necessary to get the best results. It must be properly mixed and rapidly used, for both concreting and brickwork. The sand must be coarse, sharp, clean and free from loam and clay. The water must be clean and pure. Gravel is best for concrete, and must be clean and free from large lumps. Only what will pass a 2-inch mesh should be used. If broken stone is used, it should be hard. Plenty of water should be available, and the brickwork should be what is called a "slush" job.

As an illustration of shrinkage in manufacture, it may be noted that in 1900 it took 70 miles of freight cars to deliver materials to the Baldwin Locomotive Works, while they turned out only 14 miles of locomotives. We have no information as to the miles of chips and refuse also produced.



A DIRECT-CONNECTED MOTOR APPLIED TO AN EXISTING LATHE.

Application of a Direct-Connected Electric Motor to an Existing Lathe.

The accompanying illustrations show a very successful application of an electric motor to an existing 72-inch Putnam lathe at the Schenectady works of the General Electric Company. Electric driving is now practically universal in these works, and on the larger tools the motors are individual and direct connected. The combination of a direct-connected motor with a new machine offers, as a rule, no difficulties, but this is not always the case with tools which are already on hand.

The lathe here shown had originally the usual cone pulley on the live spindle. In making the change a quill *a* was put on the spindle in place of the old pulley. The original spindle back gears *b* and *c* were retained and two gears *d* and *e* were added. These were secured solidly together and the old clutch pin indicated at *f* was retained to enable the motor to drive the spindle direct or through the back gears as the cone pulley had done. A variable-speed motor *g* was mounted inside the headstock and on a convenient cross-girt *h* of the lathe bed. The shaft of the motor was fitted with two pinions *i j* of different sizes, and two intermediate pinions *k l* were fitted to mesh with *i* and *j*, respectively. The intermediates were mounted on a swinging frame *m*, somewhat after the manner of the usual lathe feed tumble gears, the frame being operated by the lever *n*, which is connected with the frame *m* by the rod *o*. It will be seen that by the operation of the lever *n* the motor spindle may be made to drive through either of the trains *i k c* or *j l d*.

The lathe was originally both double and triple back geared, and these gears were retained after the motor was added. The range of speed of the motor is approximately 2 to 1; and, figuring from the highest and lowest motor speeds only, twelve speeds may be given to the spindle. By adjusting the speed-regulating rheostat a large number of intermediate speeds can be obtained between each successive pair of these twelve.

The machine as it stands has none of the appearance of a made-over arrangement. On the contrary, we think most observers would assume it to be an original design, unless informed to the contrary. It has proven entirely satisfactory in service.

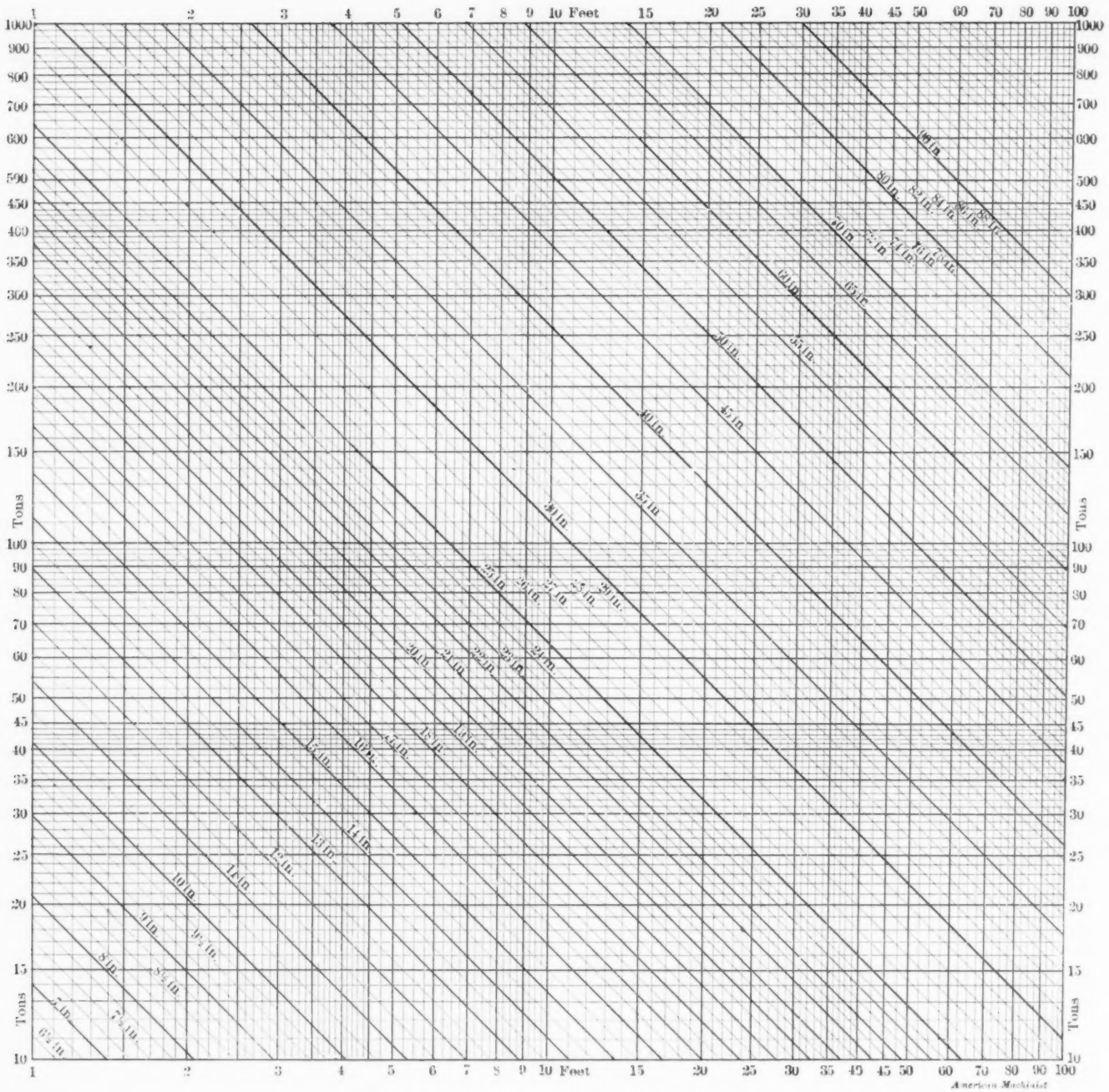


DIAGRAM A FOR BEAMS OF UNIFORM STRENGTH.

Diagrams for Laying Out Beams of Uniform Strength.

DESIGNED BY E. KALLBERG.

The accompanying diagrams, which have been furnished us by their designer, are of special use in the design of stakes for steam and hydraulic riveting machines. The beam of uniform strength gives considerable economy of material and hence is desirable for situations of this kind where the amount of the material is large and the cost high. The design of such beams by the usual methods for anything but simple cross-sections involves considerable labor which is very greatly abbreviated by these diagrams. The diagrams are for use with any material of which the compressive strength is about six-fifths of the tensile strength. In the special application for which the diagrams are intended the material used is, of course, steel casting.

The method of using the diagrams is very simple, as will be seen by the directions for use:

For full circular sections with a fiber strain of 10,000 pounds: Read the load in tons of 2,000 pounds on the right or left-hand scale and the length of the lever in feet on the top or bottom scale of Diagram A. Follow the lines from these readings to their intersection and find the required diameter of the section on the diagonals.

For any section of Diagram B with a tensile fiber strain of 10,000 and a compressive fiber strain of 12,000 pounds: Multiply either load in tons or length of lever in feet by the value of factor X for the section as given in Diagram B and proceed as before. The result given by Diagram A is the diameter D of the various sections of Diagram B. The section may then be laid out by the proportional figures for the section selected. The value of D and the cross-section are to be determined for a sufficient number of points on the stake, the same proportional figures being used throughout the length of the stake, except that it should be noted that Diagram A will give the cross-sections at different points in the length of the stake or beam strictly according to the law of the cubic parabola. When nearing the top of the stake it is desirable to use heavier sections from Diagram B, in order to reduce the diameters at these sections and

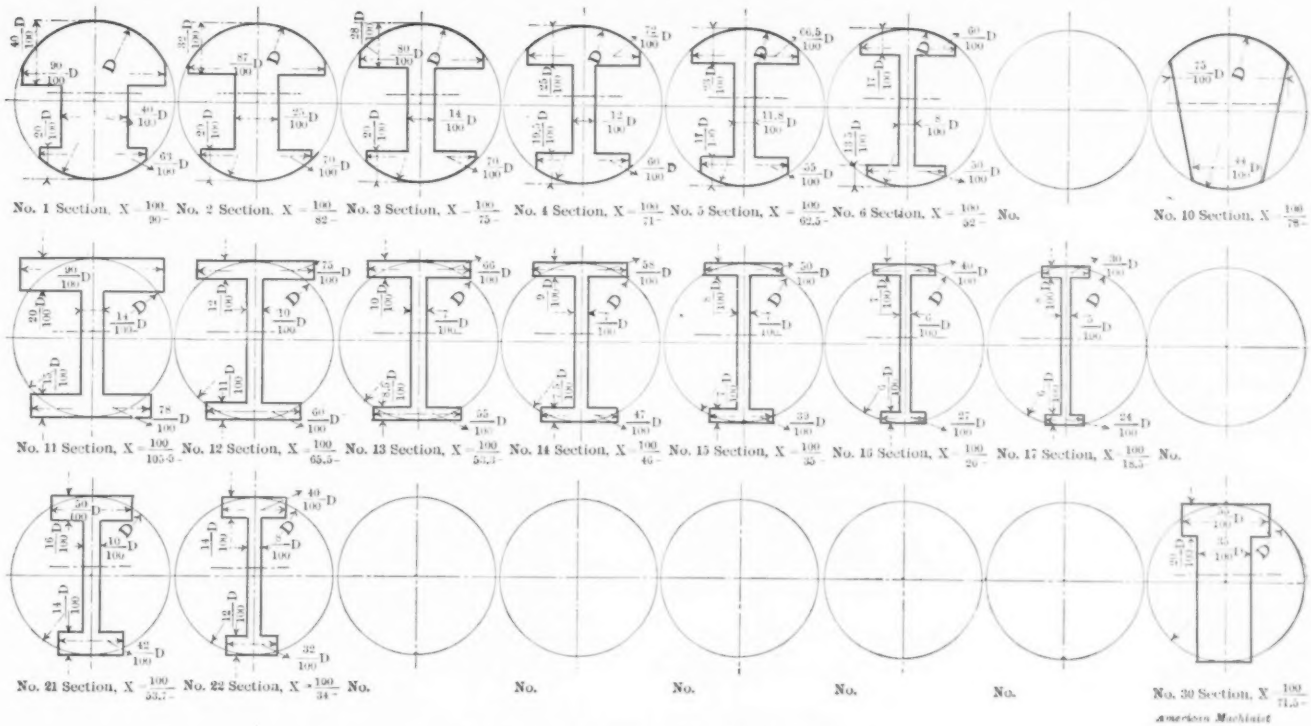

No. 1 Section, X = 100/90
No. 2 Section, X = 100/82
No. 3 Section, X = 100/75
No. 4 Section, X = 100/71
No. 5 Section, X = 100/62.5
No. 6 Section, X = 100/52
No. 10 Section, X = 100/78
No. 11 Section, X = 100/105.5
No. 12 Section, X = 100/65.5
No. 13 Section, X = 100/55.5
No. 14 Section, X = 100/46
No. 15 Section, X = 100/35
No. 16 Section, X = 100/29
No. 17 Section, X = 100/18.5
No. 21 Section, X = 100/55.7
No. 22 Section, X = 100/34
No. 30 Section, X = 100/71.5
American Machinist

DIAGRAM B FOR BEAMS OF UNIFORM STRENGTH.

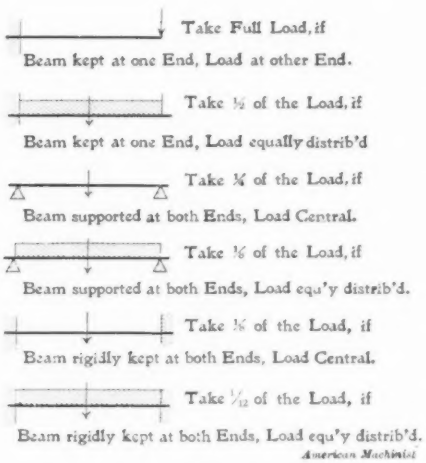

Take Full Load, if
Beam kept at one End, Load at other End.
Take ½ of the Load, if
Beam kept at one End, Load equally distrib'd
Take ¼ of the Load, if
Beam supported at both Ends, Load Central.
Take ⅛ of the Load, if
Beam supported at both Ends, Load equ'y distrib'd.
Take ⅛ of the Load, if
Beam rigidly kept at both Ends, Load Central.
Take 1/12 of the Load, if
Beam rigidly kept at both Ends, Load equ'y distrib'd.
American Machinist

DIAGRAM C. METHODS OF LOADING.

also to avoid thin ribs which could not be cast in steel.

For any other tensile fiber strain than 10,000 pounds: Multiply either the load in tons or the length of lever in feet by 10,000 and divide by the desired tensile fiber strain and proceed as before. In the resulting beam the compressive fiber strain will always be equal to six-fifths of the tensile strain.

Example: Find the dimensions of section 3 of Diagram B for a riveter stake at a point 8 feet below the dies. The pressure on the dies is 70 tons and the tensile fiber strain is not to exceed 8,000 pounds. The value of section factor X for section 3 is $\frac{100}{75}$ and, performing the multiplication, gives:

$$70 \times \frac{100}{75} \times \frac{10000}{8000} = 117$$

Finding this load at the right and the length, 8 feet, at the top of Diagram A we find at the intersection of the lines through these points 28½ inches as the value of D for the section.

The use of Diagram 3 for various methods of support and of loading is self-explanatory.

An Improved Gang Die.

BY JOSEPH V. WOODWORTH.

In the "American Machinist" No. 3 there appears a description of a die for the manufacturing of caps for oil-can spouts, and the writer says that it "overlaps anything he has seen." His experience in drawing sheet metal must be limited, as the principle of his die is nothing new, but is in almost universal use where economy and capacity are imperative. I submit the accompanying sketch as an illustration of a punch and die that is in use in the manufacture of small buttons, eyelets, shell rivets or anything of that character that it is necessary to produce in large quantities. To secure the minimum cost of operation the stock is fed automatically by means of the regular fine tooth, ratchet roll-feed, which secures fine adjustment of the stroke.

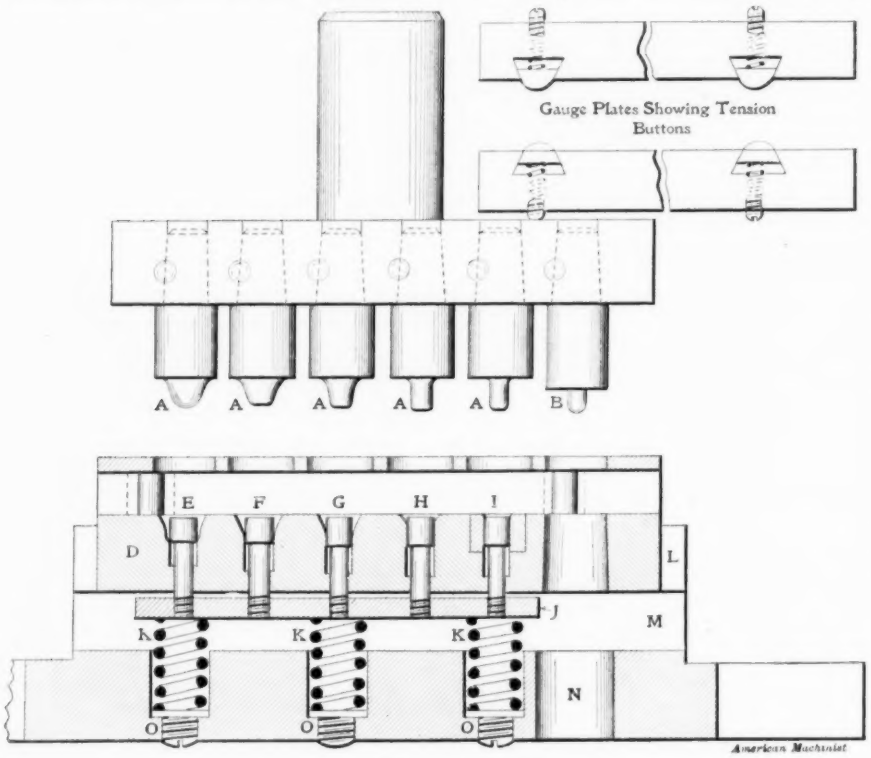
In brass work, where we can get our metal drawn in long lengths and of approximately uniform width, the die will run off the entire strip without any attendance or possibility of error, which allows the press hand to look after several presses and keep them running continually. It is always necessary, when drawing sheet metal, to hold it securely in order to have it draw uniformly. This is one of the points in which the die above referred to is defective. There are also several other points which will become apparent to the practical reader in the description of the die here shown.

As the illustration shows clearly the various parts used in the construction of the punch and die, very little description is necessary. The stems of the drawing punches A, as well as that of the blanking punch B, are taper; they are driven in tightly, and then permanently secured by means of a taper pin C through the side of each. This means for fastening the punches is far superior to the usual way by means of a set-screw. The die D is finished in the usual way, except the last drawing and finishing die, which is removable when worn by using and inserting a bushing, and when the die wears this is removed and replaced by another. Each of the drawing dies is finished with a plunger, which is hardened and let into the pad J. These plungers serve the double purpose of holding the metal while being drawn and of stripping it from the dies afterward, thereby leaving the metal free to be fed forward for the next stroke. A channel planed lengthwise in the bolster allows the pad J to work up and down. The three springs $K\,K\,K$ keep the plungers up with sufficient tension to hold the metal securely between their faces and the faces of the punches while being drawn. Their pressure is adjusted by the screws $O\,O\,O$. The blanking punch B has a pilot pin, which fits the last drawing snugly and locates it true and central before being blanked.

The metal is drawn uniformly, as each punch draws an equal amount, except the last, which finishes and sizes only. The construction of the punch and holder insures its rigidity. As to the feeding ap-

paratus, all possibility of the slipping of the metal in the rollers is eliminated by the use of the adjustable tension buttons in the gage plates up at the right, which makes the whole tool positive in action.

I wish to disclaim any attempt to underestimate the value of the die previously shown in the "American Machinist," but I submit the die here shown as what experience and use has taught me that a die of this kind should be.



AN IMPROVED GANG DIE.

Letters from Practical Men

Rectangular Emancipation and Solid Misery.

Editor American Machinist:

I read Mr. Tecumseh Swift's article in the "American Machinist" No. 50, of last year, and, as usual, his writing made me think. That is why I have a grudge against Mr. Swift. Thinking is too much like hard work to suit me. This time, however, I felt inclined to forgive him many of his past sins, for he solved the problem that has troubled my days and disturbed my nights. He has cleared away the perplexities that beset the present-day machine-tool designer. The manner in which he applies a motor to a radial drill is so exquisitely beautiful in its extreme simplicity that I called myself all the bad names that I could think of, beginning with the synonym of donkey, and so on, all the way down. Here I had been thinking for several years about this same problem (and, as I said, thinking is decidedly objectionable to me); thinking, until the boiler was ready to burst, and the result of all my best labor was only something which my enemies could not call a motor with a machine tool attached to it. I had done this same thing perhaps two or three hundred times; I had applied motors to lathes, and radial drills, and boring mills, and planers, and slotters, and shapers, and bending rolls, and what not. And in all that time, and with all these examples before me, the beautiful idea which radiates from Mr. Swift's article had never struck me. It is as simple as can be. Take a motor, put a worm on the motor shaft and a worm-wheel on the spindle, and the thing is done.

Since I wrote the above several days have passed, and with them a good part of my enthusiasm. There are one or two, perhaps more, difficulties left unsolved. You see, a radial drill has to bore all sizes of holes in all kinds of material. I have in mind a certain radial drill which is supposed to drill equally well at a 2-inch hole in steel or a ¼-inch hole in brass. In the first place, the drill makes about 20 revolutions per minute, in the latter about 400. That means that the motor must be capable of running at one time 20 times slower than at another.

I think it cruelty to animals on Mr. Swift's part not to mention this, as his article only says "the motor is there." Now "there" is very indefinite. *Where* is that motor? I have been looking for that very same motor so long and so often that I actually smack my lips when I read that the motor, which at one time runs 20 times faster than at another is "there." Of course, Mr. Swift does not mean to use a series wound motor, as such a one would run away without load, or jog along like a cab horse when drilling a big hole. It may be that some will think that this is not quite so bad, as a drill should run slow when drilling a large hole. But when a drill makes a 2-inch hole it should run only two times slower than when making a 1-inch hole (in solid metal); but the pull on the drill is about four times greater (practically as the squares of the diameters). Therefore, the power consumed is twice as great in the first case as in the second. A series motor, however, gives within its range of usefulness practically the same power at all times, so that it will not do for a drill. Worst of all, there are cases when a drill should run slow (for instance, for enlarging a hole of considerable size), though the amount of metal to be removed may be very small, and therefore little power is needed. Once more, then, a series-wound motor will not do. A shunt-wound motor is the kind required for almost all machine tools. It runs steady and never goes off on a spree. I have occasionally tried (though that was long ago) to find a motor with variable speed of a range of, say, 1 to 4. But I have given that up. Still Mr. Swift says "the motor is there." So is the North Pole, and little the good it does me. Now, if he really cares to do me a good turn (and I don't doubt it, because he does not know me), let him tell me *where* that motor is. Nowadays I feel happy if I can get a motor with a speed range of 1 to 2. Consider, then, how I shall feel when I shall clap my eyes on a motor with a speed range of 1 to 20.

I would not mind Mr. Swift having his quiet little joke occasionally, but I am afraid somebody who is in the market for some new machine tools might take him *au serieux* and might insist on my designing him a radial drill with that "motor that is there." In that case, there would be no way for me to get back at Mr. Swift, and even his sympathy would not help me.

How one cause may have different effects on different people! The sight of a motor arouses in Mr. Swift visions of rectangular emancipation; in me, it awakens memories of solid misery.

A. L. De Leeuw.

Hamilton, Ohio.

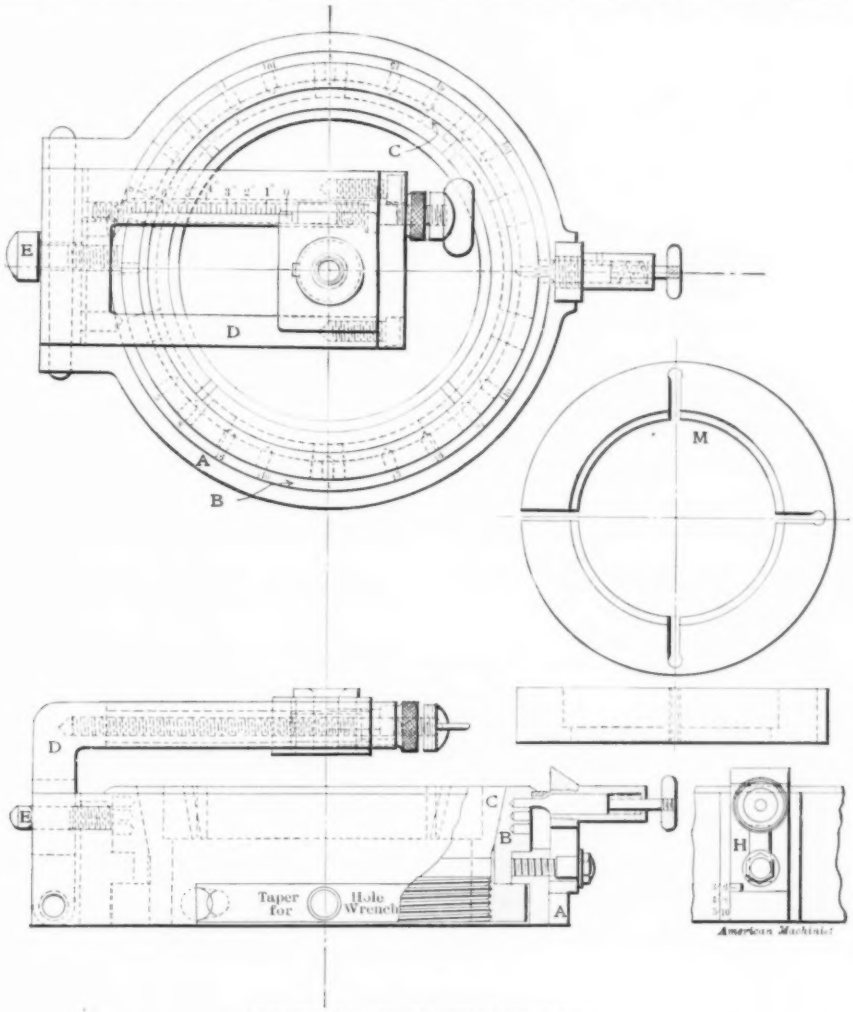
Adjustable Jig for Drilling Rings.

Editor American Machinist:

The tool here shown is for accurately spacing and drilling holes in cast-iron rings of different sizes and for drilling clearance holes in thread-cutting dies. The tool is made for use in the toolroom, where a large number of rings are made for inserted cutter, boring and facing tools.

The base *A* is a casting bored to receive the steel indexing ring *B*, to which is fitted the clamping sleeve *C*, with a ring nut shouldering on the index ring.

The clamping sleeve *C* is slotted in three places to form a spring chuck to hold the largest ring or an auxiliary binding collet shown at *M*. The drill bushing is adjustable in a sliding block controlled by a thumb-screw and can be set to the graduations shown on top of the swinging arm *D*, which swings on a taper-pin, and is held firmly by the flat-head thumb-screw *E*. A quarter-turn backward of the thumb-screw lets it pass through an elongated slot in the swinging arm *D*. The index pin is set in a steel piece fitted to a slot in the base casting, and is adjustable vertically for the different spacings of 6, 8 and 10 (see *H*), which also give 2, 3, 4 and 5 indexing. Graduations are also stamped on the beveled top edge of the index ring and marked with figures to readily locate the pin holes and denote the proper spacing. D. E. MacCarthy.



ADJUSTABLE JIG FOR DRILLING RINGS.

Correct Measures Incorrectly Located

Editor American Machinist:

The draftsman often sees, after things have gone wrong, how easily he could have avoided trouble if he had only used a little forethought. Such forethought only comes by experience, or often by being told of the mistakes of others. The young draftsman thinks he knows, and he really does know, how to make a drawing; but still things that are laid out by such men do not always fit. There may not really be any mistake in the drawing, and yet trouble might have been avoided had the drawing been made differently.

A draftsman is not likely to make a similar mistake twice, and he is often enabled to avoid mistakes by being told of the mistakes of other draftsmen. For this reason I am always glad to know of the mistakes of others, and I do not mind telling people where I have found trouble.

I remember, some time ago, to have laid out some buck stays. There were eighteen of them, made of 2½x12-inch steel slabs, 10 feet long, and each was to have six 1½-inch holes drilled in it. The buckstays were to hold a frame in shape. For convenience we may call the side of the stays next to the frame the front or working side, and the opposite side the back of the stay. The holes were laid out from the back side of the stay, and when the castings were bolted on, they projected ½ inch into the frame. The drawing was checked, and the figures were found to be all right; then the work was checked and found to be like the drawing. We then saw that the slabs were only 11½ inches wide. As the holes were laid out from the back edge they were ½ inch nearer the front side than they should have been. There being nothing to come in contact with the back edges of the stays, they were made to work; but it took three men and three helpers four hours to do it.

A similar trouble was experienced in laying out holes in a 12-inch channel supposed to have been 15 feet long. It was very necessary that one end of this channel should fit against a casting, which was located. Twenty-six holes were drilled and the channel was put in place, when it was found that it lacked ⅝ inch of reaching the casting. When the drawing was checked, it was found that, for some cause, the holes had been located from the end of the channel opposite the casting. The channel was then checked up and found to be only 14 feet 11⅜ inches long. It did not make much difference about the end of the channel away from the casting; so this channel was made to do by changing ends and drilling a new set of holes.

The draftsman might think that he is not responsible for the material being out of dimensions called for. So he is not; but he will find that dimensions are not always adhered to, except where they have to be; and it is the draftsman's place to avoid all trouble, if possible, that might come from these variations in dimensions.

To avoid such trouble that might occur in such cases, I have formed the following rule, which must always be adhered to, both for rough and for accurate work: In laying out work, always take the working side and end as the lines from which all points in that work are located.

Sometimes work is expected to be laid out from some imaginary line (generally the center line). When such is the case, neither side should be required to fit against some other object, and in such cases there would be no working side or end; or there may be a working end and no working side, or *vice versa*. When there is no working side I always lay out work from the most important assumed line. It generally happens that this is the center line, but such is not always the case. Experience will teach the draftsman the line that he can best use.

The Constructing Engineer.

State Factory Inspection in Practice

Editor American Machinist:

If it is permissible to criticise the law of the commonwealth, or, more properly speaking, the enforcement thereof by that body of unapproachable servants of the State, the factory inspectors, I desire to voice through your columns the sentiments of fully one-half the machinists employed in this State in an appeal for strict detail in factory inspection and rigid enforcement of the law in cases where it is almost entirely disregarded.

The law states clearly and concisely, without any opportunity for misconstruction, that "suitable and convenient washrooms and closets" shall be provided for

the use of the men. In at least one-half the shops in this country no provision at all is made for even a superficial washing before leaving the shop. An equal number of shops are providing closets which are as fit places for investigation by the local boards of health as by the factory inspectors.

I have worked in shops employing nearly a hundred men, where some of the men have refused to use the closets provided, owing to the condition of pestilence existing, and yet no account has been taken of it by the inspectors, and the men dare not complain. What redress is there? What can be done about it?

I have in my mind one shop with a large polishing department where not an exhaust fan is moving, and the average short life of the polishers is made shorter still.

The factory inspector walks through these shops—he does not *inspect* them—he seals them with the approval of the State he serves, and the poorly paid employees suffer the consequences.

LUCIEN I. YEOMANS.

Walworth, N. Y.

Port Opening in Steam Engines.

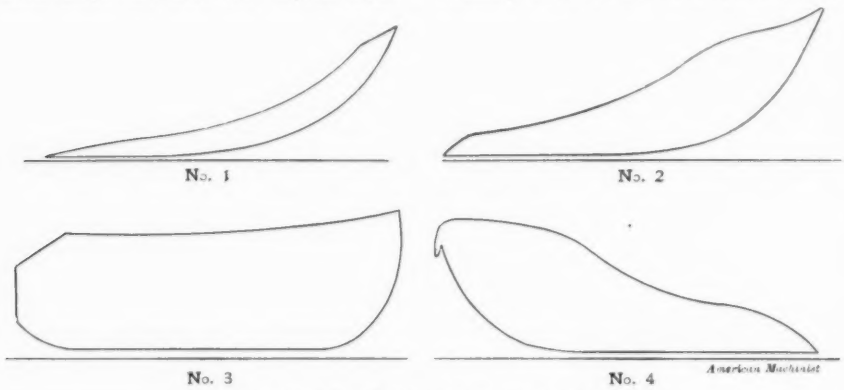
Editor American Machinist:

The article on "Port Openings" in your issue No. 49, of last year, is of much interest, and it is a source of surprise to me that others have not been outspoken on the subject before this.

I was engaged for some years in changing over ordinary slide-valve engines and attaching a variable cut-off, and I was thus enabled to judge of some of the effects of a reduced port area. The final conclusion arrived at was to discard all the old rules as to both port area and lead of valve and formulate others from practical experience. The reasons leading to this conclusion were based on absolute facts and results obtained from the changes made, and the results were in the nature of a surprise.

I enclose you several cards all taken from a common slide-valve engine after a new cut-off had been attached. The throttling governor was held wide open while cards were taken, so as to prevent as much as possible the action of the governor on the cards.

The engine was a 16x24 inch girder bed; steam ports, 1½x14 inches; exhaust ports, 3½x14. The engine was running a large factory with a general line of wood-working machinery, and on account of its excessive use of fuel it had been decided to attach a variable cut-off. The indicator cards were taken after the change had been made. On account of the small area of port opening it was doubted by those present if the engine would be able to do the work, which was considered heavy duty, but the engine not only did the usual work but increased her revolutions 5 per cent., regardless of the throttling governor. At 9-inch cut-off, card 4, we had only 7-16 of an inch port opening and also 7-16 inch lead at all points of cut-off. On card 3 we had probably ⅝-inch port opening, but with the ordinary work we did not require to carry steam that far. I may state that having now a 7-16 inch as against the previous 1½-inch port, I was somewhat doubtful, even after the facts were all gathered in; but later operations on other engines with still greater discrepancies proved conclusively that I had some lessons to learn that were not in the textbooks.



INDICATOR CARDS FOR ENGINE WITH SMALL PORTS.

I believe with Mr. Begtrup in your issue No. 44, of last year, that "fixed rules may become worse than useless on account of our deficient knowledge of what is required for best economy and that a wide scope may be given to practical considerations."

I have not, however, become a convert to all the impressions given out in regard to the limitations of the single slide valve, but on the contrary believe that we have hardly commenced to know the capabilities of this valve. It requires no mathematical formula to demonstrate that with a quick movement to open the valve and a quick movement to close it we get a better admission of steam, better exhaust and its concomitant result in reality is equal to a larger area of port opening. I hope we will hear from others on the subject.

Minneapolis, Minn. JOHN GRIME.

[In a letter accompanying his communication, Mr. Grime explains that the absence of pre-admission in his cards is due to the rapid action of the valve when the engine was on the dead centers. From this letter we judge the valve gear to have been of the radial class.—Ed.]

Cooling a Gear Cutter by Compressed Air.

Editor American Machinist:

While I was superintendent at the Lodge & Shipley Machine Tool Company's works, it occurred to me that there were great possibilities in the application of compressed air as a cooling medium for tools taking heavy cuts on cast iron. After thinking over the matter, I had an air hose connected to the oil nozzle of a No. 2 Brown & Sharpe automatic gear cutter which was running on cast iron and being crowded as much as was consistent with good work and reasonable life of the cutters.

Before turning on the air I had one gear cut in the usual manner. When completed, this gear was dropped on the floor beside the machine. Another blank was put in, the cutter and feed were both speeded up and the air was turned on. The second gear was cut in one-half the time required for the first, and after being completed it was cooler than the one on the floor, although the latter had had ample opportunity to cool while the second was being cut. An examination of the cutter showed that it had not suffered.

I thought I had struck a bonanza, but after a few hours' run I found the machine so covered with chips and iron dust that it was evidently impossible to run it without protecting the working surfaces, particularly the slides and the entire indexing mechanism. The machine was stopped, cleaned and fitted with several tin dust guards, and again I felt happy; but alas! when we changed jobs the guards no longer fitted. Next, I had two curtains fitted to the carriage with ⅜-inch steel rods for rollers. On the outer ends of the rollers were cast-iron grooved pulleys, around which cords were wound, supporting weights in such a manner as to keep the curtains always tight. These curtains were fairly successful in protecting the slides. A sheet of galvanized iron was then fitted in front of the index wheel to keep the chips away from it. This, however, directed the dust into the worm casing, and threatened to ruin the indexing, so more tin and some waste were applied there as palliatives.

By this time I was getting desperate, so I got a Buffalo exhaust blower, had a galvanized hopper made with a connection to the exhauster, and sucked the dust away from the machine. This produced a marked improvement; but still there was dust enough to damage the machine. I went outside and found that not only our own yard, but also our neighbor's was being covered with iron dust, so I had to

get a dust collector and attach it to the discharge from my fan.

The conclusion at which I arrived after much experimenting was, that while the air was undoubtedly a good thing, the present forms of machines were not adapted to its use. There is ample ground for the belief that if some of our enterprising tool builders will take up the problem of designing an automatic gear cutter in which the slides and indexing mechanism are so encased as to be safe from dust and flying chips, and provide it with a suitable connection for an exhauster, they will confer a great boon on their patrons and reap a corresponding reward.

L. O. DANSE.

Some Points in Drawing Room Practice.

Editor American Machinist:

A little over a year ago a correspondent, who was evidently a foreigner, made a number of inquiries regarding American drawing-room practice which have not been answered as yet, unless the answers were contained in one of the few issues which failed to reach me during my wanderings on the other side of the briny puddle, and which your business department was unable to replace after my return.

Probably the inquirer will be surprised at the suggestion that one cause of this silence was the fact that his inquiries were of too trivial a nature to justify attention from people who haven't a little time to kill. Everything depends on the point of view, and we Americans frequently regard as trifles matters which others regard as most weighty.

One of the inquiries was as to whether it was customary to write fractions in dimensioning a drawing with a horizontal or an inclined vinculum, and whether the figures composing the fraction were made as large as those for the integers or reduced so as to make the total hight of the fraction equal to that of the integers.

Although familiar with the practice of many of the leading drawing rooms in our country the writer has yet to hear of one in which any rule governing these points has been laid down. The two styles of vinculum are used about equally, and some of our best draftsmen use both on the same drawing. As to the size of the numerals in the fraction, it is safe to say that in the majority of cases they are smaller than those in the integers, and in most cases the fraction extends both above and below the other figures. A mechanical drawing may be a work of art in its way, but ethical considerations cut very little figure in the rules which should govern its production. As has frequently been pointed out editorially in your columns, a mechanical drawing is simply the vehicle for conveying the ideas of the designer to those who are to embody them in wood and metal, and the only considerations which should govern its production are those which affect its clearness and legibility or those which will facilitate reference to it. The form in which the fraction is written is manifestly without influence on any of these. It is important, however, that all the figures be of such size and so located as to be easily read.

Now, one of the really important matters in connection with dimensioning a drawing is the location of the figures. One rule, whose utility cannot be gainsaid, is that they should be so located that they can be altered or erased without damage to the lines of the drawing, as changes may be necessitated either by original errors in writing down the figures or by changes in the design being found desirable during the construction of the machine. Of course if changes in dimensions are made after one or more machines have been completed, a new drawing should be made, embodying the changed dimensions, and the old drawing should be marked: "Void after No. ——. See tracing ——." If consecutive numbering of the machines produced is not the practice of the shop, the shop order number may be used to fill the blank; and if shop orders are not numbered, a system which will permit the ready identification of the machines had better be introduced without further delay.

One point in which the writer has found much cause for criticism is the habit many draftsmen have of dimensioning turned and bored work on the end view, giving a number of radial dimensions in a bunch which resembles a spider web more than anything else, and frequently leads to confusion. Generally it is preferable to give the diameters on a section, except for bolt or spanner hole circles, which are usually best shown on the end view. Still, this is one of the points on which no hard and fast rules can be laid down and on which more common sense might be brought to bear than is occasionally shown.

Your correspondent wanted to know whether American draftsmen were permitted or required to place their names or initials on their tracings, and what arguments there were for and against the practice of signing drawings. This is a matter in which practice differs; but in general the desirability of identifying the author of each drawing is recognized. In some shops the standard drawing title includes the words: "Designed by .... Drawn by .... Approved by .... Checked by...." In others the draftsman and tracer are required to place their initials at a designated portion of the sheet, those of the latter below the former. In a very few shops signing drawings is prohibited; perhaps because the powers that be are afraid the draftsmen might get the swelled head like themselves.

Another thing that worried your correspondent was what kind of titles were used on our shop drawings. Well, this is a big country and it contains an enormous number of shops, big, little and "middlin'," some growing and others subsiding into senile decay; so it would be unreasonable to expect that uniformity had been attained in this matter, even though we have taken the lead in the matter of standardizing our mechanical products. Still, our rapid growth has resulted in a multiplication of drawings which has made it imperative to take measures for the ready locating and identifying of needed drawings. One of these measures is the uniform location of the titles of all the drawings belonging to a given concern, so that a pile of drawings may be readily examined and the one desired easily picked out. The practice of putting the title at the lower right-hand corner is almost universal, as that is the location which makes it easiest to read the titles without removing the sheets from the pile.

Now the question, "Of what should the title consist?" is one that depends somewhat on the nature of the business, and is variously answered by experienced men in the same business. Whether or not it is necessary to put the firm or corporate name into the title depends largely on circumstances. If many drawings are sent to outside parties, say with bids, or to concerns who supply parts or partly finished material, the titles should contain the firm name. If, on the other hand, the sending out of blueprints is rare, the time required to put on the firm name may as well be saved, and a rubber stamp used on the few that do go out.

The all-important thing in the title is the consecutive tracing number by which the drawing is cataloged and identified on time cards, etc. The date is desirable as a ready means of identifying the position of a particular drawing in the development of a product which is being improved and brought up to date from time to time. The official name of the machine or part is desirable in order to train the employees to designate things by the same words as are used in the office. The initials of the draftsman are desirable in order to locate the responsibility for omissions, errors and good work. The scale is desirable to facilitate the insertion of omitted dimensions. Generally speaking a symbol should be used in connection with the tracing number to indicate the size of the sheets, to facilitate finding it, and the number of the drawer in which it is stored should be given to enable the blueprint boy to return it to its proper location without looking up the catalog.

The sheet size symbol may be one or more zeros preceding the consecutive number, as in the system introduced a number of years ago by the writer in the master mechanic's office of the Pennsylvania Company at Fort Wayne, Ind., under the direction of Mr. D. F. Crawford, then assistant master mechanic, or it may be a letter, as in the system I have since orig-

inated and introduced in a manufacturing shop.

The size and arrangement of the title varies much more than its location and must be governed to some extent by the size of the sheet, as a sheet 4½x6 inches, a size which the writer has used for simple details, would not admit of a title which would be eminently satisfactory on a sheet 9x12 inches or over. Generally, a title 2x4 inches is quite satisfactory for all sheets from 9x12 inches up. The accompanying sample, Fig. 1, shows an arrangement which has proved the best of the many tried by the writer. The tracing number is located in the extreme corner of the sheet, so that the smallest possible turning up of the corners will be required in searching through a pile in a drawer. The sheet size symbol has been omitted for special reasons connected with the transition to the new system, but will be added later. A standard title containing the ruling, corporate title, and the word "scale," is slipped under the tracing to insure uniformity, and the only lettering put on the pencil drawing is the name of the machine or detail.

Tracings are made 9x12, 12x18, 18x24, 18x36, 24x36 and 30x36 inches. A border is ruled ¼ inch inside of this to afford a trimming line for blueprints and allow of their being made without waste from 36-inch roll paper. A second border is ruled ¼ inch inside of this one and into the angle of the latter the title is worked.

The 2-inch hight of the title is divided into three parts, as follows: $\frac{11}{16}$ inch for the corporate title, 1 inch for name of the machine or detail, and $\frac{5}{16}$ for the scale, date, signature and tracing number. The lower space is so divided as to allow 1½ inches each for scale and number and 1 inch for the date and signature. The lettering is plain gothic, made freehand, giving the maximum legibilty with the minimum expenditure of time in its production.

L. O. Danse.

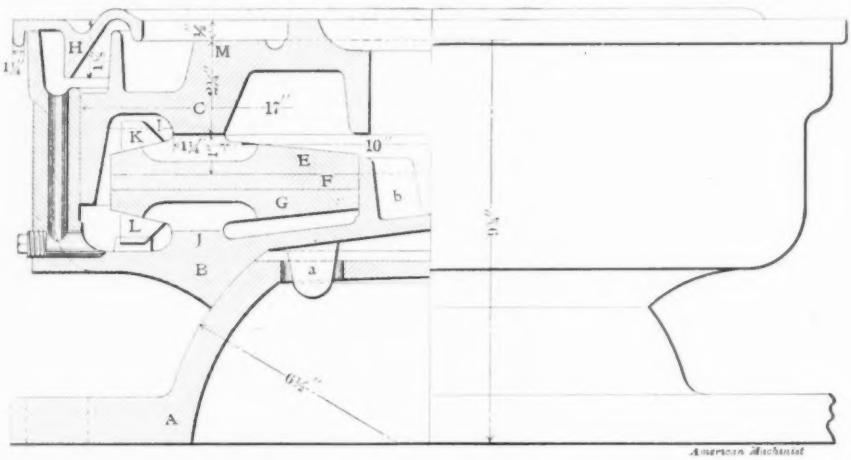
[There is a real objection to the use of the inclined division line for fractions, which has led many rules against its use in some drawing offices. The objection arises from the fact that such a dimension as $1\frac{4}{16}$, if written with the inclined line, unless very distinctly executed, may be read as $\frac{14}{16}$. We have known errors to occur from this cause. The same remark applies to $1\frac{1}{16}$, $1\frac{5}{16}$ and to many other dimensions.

The use of radial lines in dimensioning a series of concentric circles is a nuisance, though we do not think it necessary to put the figures on the section in order to avoid it. If the dimension lines are arranged as in Fig. 2, they are entirely clear and without the objections of the radial arrangement.

Contrary to almost standard practice, we consider the best place for the title of a drawing to be the *upper left-hand* corner, as it permits an arrangement of the filing drawers which is much more economical of wall room than the usual one. Sooner or later the provision of room for the cases of drawers becomes a problem in nearly all growing drawing offices. In most cases it is not a matter of floor space, but of length of wall space. By putting the title in the upper left-hand corner of the sheet, the drawers may be made with a width equal to the hight of the sheet and a depth equal to its length, instead of the reverse arrangement as usual. That is, the drawers are narrow but deep, and with the usual proportion of length to hight of sheet nearly 50 per cent. more drawers may be gotten into a given amount of wall space. With drawers of this kind, and with the titles in the upper left-hand corner, the titles come forward where they may be easily consulted, and without any disadvantage to offset the gain in compactness.—Ed.]

A Submerged Step-Bearing.

The step shown in the drawing here reproduced is called by the makers a "submerged" step because the bearing and wearing surfaces are continually submerged in oil. Vertical mills the spindles of which carry heavy weights are very common in many of the trades, and no part of them has a more responsible function or causes greater anxiety to both the builder and the user than the step.



SUBMERGED STEP FOR VERTICAL SPINDLES.

The one here shown has originated with the builders of clay-working machinery, but it is of course applicable to all vertical spindle machines, and all the conditions of the service required seem to be well satisfied. The base *A* of the step is bolted upon a level foundation. The central portion of this base, rising above the flange, is spherical and upon it sets the bowl *B*, the spherical shape allowing it to accommodate itself to the position of the spindle, whether that be absolutely vertical or more or less out of alinement. The bowl is kept from rotating by the horn *a*, which projects down into a hole in the web of the base. The upwardly projecting hub of the bowl *B* is turned, the annular surface at *J* is faced flat and the vertical periphery is bored. A thinner portion of the shell is carried still higher and over this sets a cover or dust guard which serves also as an oil shedder for catching any oil that may be carried up by centrifugal action and returning it again to the oil reservoir. Upon the annular surface *J*, and easily fitting the hub, is the cast-iron bearing plate *G*, the upper surface of which is faced flat and polished and has a large number of holes drilled through it so arranged at different radial distances that the oil through one or another is sure to reach the entire surface. The annular bearing piece below has also a number of large gutters cut across it which permit a free flow of the oil between the outer and the inner oil cavities. Upon the bearing plate *G* sets the flat plate *F* of wrought nickel steel and also having numerous holes through it. Upon this is the bearing plate *E* which is a duplicate of *G* inverted. Upon the bearing plate *E* is the casting *C* called the "plug," which is attached to the lower end of the spindle, this plug of course carrying all the weight of the spindle and revolving parts and turning with them. The periphery of this plug fits easily the bored interior of the bowl *B*, being kept concentric by that means. The bearing plate *E* is made to rotate constantly with the plug *C* by means of the horn *K*, while the bearing plate *G* is similarly kept from rotating by the horn *L*. The step is filled with oil nearly to the top, the action of the parts maintaining a constant circulation, the dirt being deposited in the bottom of the step below the bearing plates. The step for the 10-ton machine holds 2½ gallons of oil, which is enough for several months. Upon the upper flat bearing surface *M* of the bearing plate *C* rest the ends of two half-clamps, not shown, which clasp the end of the shaft and when these are removed, the shaft and its load being blocked up, the entire step may be slid out sideways if necessary, thus avoiding the necessity of pulling the entire mill to pieces and doing a lot of heavy hoisting. This step is made by the Turner, Vaughn & Taylor Company, Cuyahoga Falls, Ohio.

American Members of the Legion of Honor.

One of the results of the Paris Exposition is that a large number of American citizens have been honored by the decoration of the "Legion of Honor," which in France carries with it some special privileges. Many of the Americans so decorated are connected with machinery interests or mechanical engineering work and among those whose names we recognize as being so connected are William Deering, Francis E. Drake, James W. Duntley, Alexander Gordon, Henry M. Howe, Cyrus H. McCormick, John S. Patterson, Francis C. Pratt, Chas. T. Schoen, Ambrose Swasey, George Westinghouse.

Personal.

A. E. Borie has been appointed general sales agent of Bethlehem Steel Company, with headquarters at South Bethlehem, Pa.

H. A. L. Woodcock, for the past four years foreman of the Morse Twist Drill Company's tap and die department, has resigned to accept a position with Mergenthaler Linotype Company, Brooklyn, N. Y.

Hon. Charles A. Prouty, member of the Interstate Commerce Commission, delivered on January 21 an address before the engineering students of Purdue University, his subject being "The Relation of the Railways to the People," which he treated by presenting in outline the work of the Interstate Commerce Commission.

Obituary.

Charles Cooper, founder and head of the firm of the C. & G. Cooper Company, builders of Corliss engines, Mount Vernon, Ohio, died at that place February 8, ninety-two years old. He is said to have been the first to build a locomotive west of the Alleghanies.

James Moore, for more than half a century proprietor of the Bush Hill Iron Works, of Philadelphia, died in that city February 9, eighty-two years old. Mr. Moore was a native of Ireland, and was brought to Philadelphia with his family when eight years old. He attended the city schools and at sixteen years of age was apprenticed to the Norris Locomotive Works, being released from there to become a mechanical engineer. When twenty-six years old he went to J. P. Morris' Iron Works, on the Delaware, and was soon made manager. In 1846, then twenty-eight years old, he with two partners, under the firm name of Neall, Matthews & Moore, established the Bush Hill Iron Works. The principal business, besides boilers, was the building of rolling mills. The works passed into the sole control of Mr. Moore in 1870, and they continued in operation until 1895, when the property was sold to the United States as a site for the new Mint.

At the Newport News shipyard is soon to be opened up a drydock 860 feet long over all, 806 feet on the bottom, 162 feet broad on top and 80 feet at the bottom. The water will stand 30 feet over the sill. The advance in size made by this dock may be judged from the statement that while no other in the country is large enough to accommodate the new "Celtic" —680 feet long, 75 feet beam—this one would hold her and another smaller vessel at the same time.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant ; see p. 24.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Wanted—Index, 1895. Box 303, AM. MACH.

Wanted—No. 44, Vol. 19. Box 304, AM. M.

Gasoline motor castings ; best jump-spark plug made. Orswell, 34 Beach, Boston.

Light and fine mach'y to order ; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, Pa., build light machinery.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Designer wishes to correspond with firms desiring to manufacture gas engines. Box 283, AMERICAN MACHINIST.

Designing, manufacturing machinery, automobile engines and experimental work for inventors. Ohl Machinery Co., Newark, N. J.

German mech. engineer with patents for fine machines desires to interest capitalist or manufacturer. Box 285, AMER. MACHINIST.

Threads and gears ; easy rules to cut any thread possible to be cut in the lathe, without algebra, sent to any address for 25c. by G. W. Dixon, Spring Lake, Mich.

Made to Order—Special clock movements, metal novelties, gears a specialty ; difficult work our specialty. Smith Novelty Co., 28 Commerce st., Trenton, N. J.

Wanted—A second-hand engine lathe of heavy pattern, 30 or 26 in. swing, drop bed, with compound rest and power cross feed. Box 284, AMERICAN MACHINIST.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Mechanical draftsman wishes position. Address Box 318, AMERICAN MACHINIST.

Lathe hand would like position ; thoroughly experienced. Box 291, AMER. MACHINIST.

Wanted—Position as first-class draftsman, by mechanical and electrical engineer. Box 319, AMERICAN MACHINIST.

Position as foreman of gear cutters and milling machines ; good references. Address Box 290, AMERICAN MACHINIST.

German mechanical engineer and constructor, with best references, wants position. Box 286, AMERICAN MACHINIST.

Wanted—Position as machinery salesman, by practical young machinist and draftsman. Box 306, AMERICAN MACHINIST.

As head foreman on light and medium class work ; large experience ; modern methods ; expert on tools. Box 317, AMER. MACHINIST.

Young man, educated in Germany, speaking German only, seeks position as mechanical draftsman ; no experience. Box 302, AM. M.

Wanted—By foundry foreman, foremanship of foundry making engine castings or general jobbing, heavy or light. Address Box 178, AMERICAN MACHINIST.

Experienced electrical engineer wants position with manufacturing concern, or on installments of electrical light or power plants. P. G., care AMERICAN MACHINIST.

Up-to-date foreman machinist, thoroughly experienced in gasoline motor and automobile construction, desires to change position. Address Box 310, AMERICAN MACHINIST.

Young man, graduate from German technical university, master of French, German and English, desires position as salesman in machinery line. Box 308, AMER. MACHINIST.

Automatic screw machine operator ; many years' experience on Pratt & Whitney, Spencer, Acme and Brown & Sharpe ; can do all camming. Box 316, AMERICAN MACHINIST.

Situation wanted by an experienced superintendent of machine shop and foundry ; experienced on engines and general mill work of all kinds ; age 37. Address D. W. G., care AMERICAN MACHINIST.

Factory manager or superintendent ; can reduce cost to minimum ; can produce best interchangeable work, and can show just what it costs. For proof address Box 305, AMERICAN MACHINIST.

Mechanical engineer, sober, reliable and competent, having had long experience in charge of men, machinery and power plants, desires a change of position. Address Box 227, AMERICAN MACHINIST.

Young man with German technical education and 5 years' experience as draftsman wishes to change ; tool machine building concern and New England States preferred. Box 307, AMERICAN MACHINIST.

Draftsman and engineer, experience on general machinery, laying out and maintenance of plants, mills ; shop work ; can act as assistant to superintendent or master mechanic. Box 289, AMERICAN MACHINIST.

A young man with technical education desires position in some branch of mechanical engineering where there are good future prospects ; 6 years' experience in designing. Address Box 309, AMERICAN MACHINIST.

Up-to-date superintendent or general foreman for a large machine shop wants to change ; had 20 years' experience in handling men ; general jobbing shop preferred, either South or West. T. T., care AMER. MACHINIST.

Wanted—A position as superintendent of a machine, foundry and pattern shops (power machinery or air compressors preferred), by a man with technical education and practical experience ; best of references furnished. Box 301, AMERICAN MACHINIST.

A teacher of machine drawing and design, with technical training and an extensive experience in a prominent technical school, desires to contract with a college or technical school to teach them subjects during the session 1901-1902. Address Box 287, AM. M.

Foreman of machine shop, up to date, can organize and handle men successfully, best of references, 30 years old, married, experienced on printing press, wood-working machinery, engines and general repair work, desires position as foreman or assistant superintendent. Address Box 288, AMERICAN MACHINIST.

Mechanical engineer and chief draftsman, 15 years with leading builders of U. S., designer of largest types of vertical and horizontal direct-connected and mill engines, Corliss and gridiron valve types, high duty municipal and mine pumping engines, hoisting plants, air compressors, blowing engines, shop methods, costs, contracts, specifications, desires to change. Address M. B. M., Box 315, AMERICAN MACHINIST.

Help Wanted.

Draftsman wanted ; intelligent young man in shop 15 miles outside of New York. Box 294, AMERICAN MACHINIST.

Wanted—Practical man, thoroughly conversant with manufacture of fire sprinkler heads. Box 296, AMERICAN MACHINIST.

Wanted—Three or four first-class toolmakers ; state age, wages expected and class of work most familiar with. Box 295, AM. M.

Wanted—A thoroughly competent pump

(Continued on next page.)

The International Correspondence Schools, Scranton, Pa., entertained nearly fifty of their official representatives, coming from Maine to Manitoba, early in February. Several meetings were held, at which addresses were made by T. J. Foster, president of the schools, and others, and a banquet was given accompanied by music from an orchestra.

Manufacturers.

J. H. Hartley, manufacturer of boilers, Montgomery, Ala., will add a foundry.

The American Woolen Company, Boston, Mass., will build a new mill at Maynard.

J. R. Cook & Son, Americus, Ga., will put up new iron foundry and machine shops.

The Haney grist mill, burned at Mexico, Ind., some time ago, will be rebuilt at once.

The main building of the Princeton (Ind.) Elevator Company was burned February 4.

The Handbury Heater Company is contemplating the erection of a factory in Pekin, Ill.

It is reported that John Bostwick will build a modern roller mill near Madison, Ga.

E. Knapp & Co., manufacturers of bean pickers, Middleport, N. Y., will build a new machine shop.

R. O. Bowers, Jr., will enlarge his sardine canning factory at Cutler, Me., and put in a new boiler, oven, etc.

The owners of the Wheeling (W. Va.) "News" will erect a six-story building for their plant next spring.

A 200-barrel-a-day flour mill is projected at Temple, Tex., W. E. Werksheiser's elevator to be combined in the deal.

The Fore River Ship & Engine Company has been incorporated in New Jersey with a capital stock of $4,000,000.

The Union Boiler Manufacturing Company, Lebanon, Pa., has broken ground for a new 60x100-foot factory annex.

O. L. Carter & Co.'s flour mill at Duncan Falls, O., was destroyed by fire February 7, with a loss of about $25,000.

Walter Jermyn will, it is said, build a foundry at Oswego, N. Y., for manufacturing an automatic stoker for boilers.

Louis Burgett, Middleport, N. Y., who has invented an automatic tire inflator, will erect a shop to build his machines.

The Donaldsville (La.) Rice Mill plant will, it is estimated, cost $100,000. Frank Walker has supervision of the building.

A Pittsburgh report states that the Clinton Iron & Steel Company is to make improvements which will cost $300,000.

A cotton factory is projected to be built at Texarkana, Tex. J. Smith, of Denison, has made a proposition to that end.

Fire, February 11, destroyed the machine shop and roundhouse of the Boston & Maine Railroad at Mechanicville, N. Y.

The Western Star Milling Company, Salina, Kan., recently incorporated, will reopen an old mill, putting in new machinery.

The boiler works of McDermott Bros., South Bethlehem, Pa., were burned February 11, but are expected to be rebuilt.

The Tifton (Ga.) Cotton Mills Company will issue $50,000 bonds to complete the plant and put it in full operation.

The McCormick Manufacturing Company, on Southwest Eleventh street, Des Moines, Ia., will erect an excelsior factory.

Plans have been drawn up for an addition to the plant of E. P. & C. C. Townsend, makers of rivets, etc., New Brighton, Pa.

(Continued on next page.)

Help Wanted—Continued.

salesman; an excellent salary will be paid to the right party. Box 236, AMER. MACHINIST.

Wanted—A mechanical draftsman, familiar with engine work. Address, stating age, experience and salary expected, Box 311, A. M.

Wanted—A first-class machine blacksmith; one used to machine forging and fine tempering; steady work to right man. Box 292, AMERICAN MACHINIST.

Wanted—A good, practical draftsman on engine and machine design; steady employment; reliable concern. Address Box 314, AMERICAN MACHINIST.

Wanted—Several first-class mechanical draftsmen; steady work and good wages; state experience and wages wanted. Struthers, Wells & Co., Warren, Pa.

Wanted—Experienced draftsman for medium-speed engine work; one with Corliss engine experience preferred; give full particulars. Box 312, AMERICAN MACHINIST.

Wanted—Experienced draftsmen and designers for engine and air-compressor work; state age, references and salary expected. Address Box 313, AMERICAN MACHINIST.

Wanted—Two experienced draftsmen familiar with steel works machinery in general; state age, experience and salary wanted. Address Shelby Steel Tube Co., Shelby, Ohio.

Wanted—A superintendent of machine shops in Western city near Chicago; must have good references. Address, giving class of work heretofore engaged in, Box 298, A. M.

Wanted—Two toolmakers; one making tools for working on iron; the other on tools for brass; give references, experience and wages wanted. The Goulds Mfg. Co., Seneca Falls, N. Y.

Wanted—Two first-class erecting engineers; must be men of good address and familiar with high-speed engine work. Address, stating age and experience, Watertown Engine Co., Watertown, N. Y.

Wanted—A working foreman for a brass foundry in Western New York, employing four men; wages $3.50 to $4, according to ability; give references and experience. Address "Metal," care AMERICAN MACHINIST.

Wanted—Two first-class mechanical draftsmen for light automatic work in New York city; position permanent. Address letters, giving particulars in full as to experience, references, etc., Box 297, AMER. MACHINIST.

Wanted—Toolmaker in machine shop in Western city, competent to design tools and jigs for the manufacture of medium-size engines, etc.; state experience and salary desired. Address Box 293, AMER. MACHINIST.

Wanted—Man capable of taking charge, who is thoroughly acquainted with up-to-date practice in milling, large and small; must be able to tabulate results in a neat and concise manner. Address E. M. C., care AM. M.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—Experienced mechanical draftsman with shop experience, who can design jigs, templates and special tools used in modern machine shop methods; good opening for a bright young man; references requested. Curtis & Co. Mfg. Co., St. Louis, Mo.

Wanted—By Clark Bros., Belmont, Allegany Co., N. Y., machinists; Buffalo wages and steady employment; Belmont is a pretty village of 1,500 inhabitants, in the natural gas belt, with first-class schools, low rents and every inducement to men with families.

Wanted—General manager of machine shops, foundry, etc., employing 800 men; a good opening for a man of experience with ability in both mechanical and executive departments. Address, with references and advise past experience, Box 299, AMER. MACH.

Wanted—Several experienced mechanical and electrical draftsmen, also some first-class mechanical designing draftsmen; the latter need not be electricians. Apply, giving age, record, references and salary required, to Engineer, Drafting Dept., General Electric Co., Schenectady, N. Y.

Machine shop foreman; man capable of handling about 40 to 50 men in machine shop on very heavy work; must have sufficient executive ability to guide work through the shop without conflict; the right man will be well paid. Address, stating experience and giving references, Lock Box 1324, Paterson, N. J.

Superintendent for established machine tool shop in the East, employing about 150 men; must have had experience in a similar position and must be thoroughly capable as a mechanic and organizer; best of references will be required, and a good salary will be paid to the right man. Address Box 300, AMERICAN MACHINIST.

Wanted—By an established concern manufacturing high-grade machine tools, a first-class draftsman who is thoroughly familiar with the designing of turret head chucking machines for both screw and general work; must have held a position with some leading concern manufacturing machinery of this class; a splendid opportunity for the right man. Write, giving full particulars, to Box 280, AMERICAN MACHINIST.

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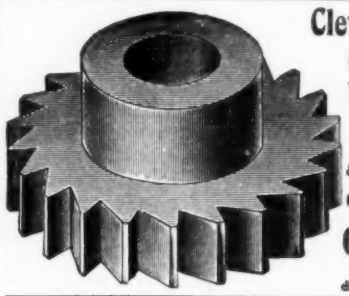

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